SECTION 11

Part A

Lift Hydraulics

Section 11 - Part A

Lift Hydraulics

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11A . 1 SPECIFICATION:

Hydraulic pump:

Model	...	MK 3
Type	...	Four cylinder, scotch yoke, driven from the PTO drive line
Output Standard flow	...	4.7 gpm (17.8 lpm).

Pressure relief valve setting:

MF.2605/2615	...	190 - 225 kg/cm^2 (2702 - 3200 psi)
Functions	...	Draft control, Position control, Response control, and Constant pumping.

Lift cylinder size:

MF.2605/2615	...	3 1/8 inch (79.4 mm) diameter

Settings required:

Draft Control rod clearance	...	0.228 inch (5.8 mm).
Vertical lever load	...	1.3 kgf (2.86 lbf)
Vertical lever setting angle	...	90^o
Response lever clearance	...	0.236 inch (6 mm).
Linkage loads for running adjustments	...	400 kgf (882 lbf) minimum.
Lift arm rotation Transport setting	...	0.236 inch (6 mm).

Special tools:

MF.148B	...	Pressure test gauge
MF.163	...	Spring retainer nut wrench
MF.226C	...	Lift cover remover/replacer
MF.272	...	Ram arm gauge
MF.333	...	Draft Control rod gauge
MF.349	...	Valve facing cutter and coining tool set
MF.350	...	Valve chamber circlip replacer
MF.351	...	Valve chamber plug remover
MF.352	...	Control valve spring retainer clip
MF.353	...	Control valve body ‘O’ ring guide
MF.354	...	Control valve body replacer
MF.356C	...	Position and Draft Control setting gauge
MF.420	...	Hydraulic ram piston seal replacer - 3.11 inch (79 mm)
MF.455	...	Pressure relief valve test capsule
MF.3001	...	Pressure test kit
MF 273A	...	Hydraulic control lever setting fixture.

Bolt torques:

Control spring screw	...	5 lbf.ft.(7 Nm)
Lift cover bolts	...	65 lbf.ft.(88 Nm)
Front ram cylinder nuts	...	162 lbf.ft.(220 Nm)
Rear ram cylinder nuts	...	225 lbf.ft.(305 Nm)
Pump body retaining nuts	...	29 lbf.ft. (40 Nm)
Vertical lever end plate bolts	...	15 lbf.ft. (20 Nm)
Pressure relief valve assembly	...	81 lbf.ft. (110 Nm)
Relief valve	...	18 lbf.ft. (25 Nm)
Transfer cap	...	32 lbf.ft. (44 Nm)

11A . 2 GENERAL DESCRIPTION

General: Fig 1

The Ferguson hydraulic system comprises a four cylinder scotch yoke type pump (1) which delivers oil, through a vertical pipe (2) to the cylinder (3).

A connecting rod from the cylinder piston engages in the ram arm which is splined on to the lift shaft which carries the linkage lift arms.

When oil, under pressure from the pump, is delivered to the ram cylinder (3), the piston is forced rearwards and pushes the ram arm upwards, causing the lift shaft to rotate and raise the lift arms.

Conversely, when the oil is allowed out of the cylinder, the piston moves back under the load of the lift arms.

The hydraulic pump is driven by the PTO drive from the main clutch, via the gearbox constant mesh gears and the PTO drive shaft. It is therefore rotating whenever the forward part of the PTO system is being driven.

Oil flow from the pump is controlled by an integral control valve on the suction side of the pump.

The pump control valve is moved by the quadrant levers, forces down the top link, or the cam on the cross shaft.

The speed of movement of the valve into discharge (lower) is controlled by the Response unit.

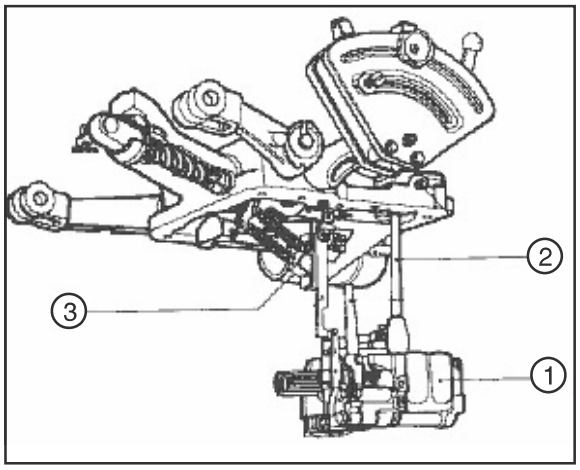


Fig 1

Hydraulic linkage pump (Fig. 2) .

The pump consists of two piston yokes (1) which ride on cam blocks located on eccentrics on a camshaft (2). The pistons reciprocate in opposed valve chambers (3), each housing two inlet (4) and outlet valves (5) and springs. A sealing plug and snap ring secure the valves in the chambers.

Front and rear pump body castings incorporate the oil galleries connecting the valve chambers, and house the control valve and the oscillator.

Attached to the rear body is the Response control (6) and strainer housing (7) and also the pressure relief valve (8).

The pressure relief valve is not adjustable and is connected to the outlet port of the pump to the lift cylinder. As each of the pump pistons moves in its cylinder it creates suction which lifts the inlet valve from its seat and draws in oil past the control valve (if open) along the intake gallery into the cylinder. During this inlet stroke the outlet valve is held closed by the spring acting on it. When the piston reaches the end of its inlet stroke, the suction ceases with the cylinder, now full of oil, allowing the inlet valve to be closed by the inlet valve spring.

As the piston begins its compression stroke, the resultant pressure in the oil keeps the inlet valve closed and lifts the outlet valve, forcing the oil past the outlet valve into the high pressure gallery and up the stand pipe to the ram cylinder.

Pump control valve. (Fig. 3 to Fig. 5).

The function of the pump control valve is to control the oil flow to and from the hydraulic system. In order to carry out this function, it has 3 positions: 'Intake' (raise), 'Neutral' (stationary) and 'Discharge' (lower).

The main advantage of the Ferguson System is that the pump gives a variable flow by controlling the degree of opening of the intake and discharge slots in the control valve assembly giving complete control across the full range.

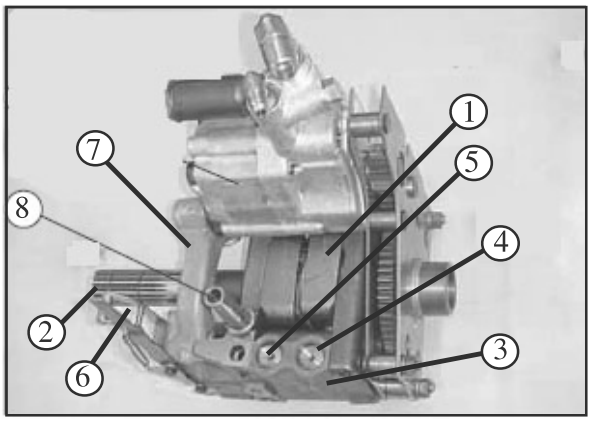


Fig 2

The control valve has intake and discharge slots at either end and is moved into its various operating positions by a vertical lever controlled by the linkage arrangements within the top cover assembly. It is spring loaded to the intake position. The valve is oscillated to prevent it sticking. It slides within a sleeve which has ports leading to the intake and pressure sides of the pump.

In Fig. 3, the vertical lever has moved to allow the valve to move to the intake position under the influence of the spring. This allows oil to be drawn through the intake slots into the pump. In this position, the lift arms would be rising.

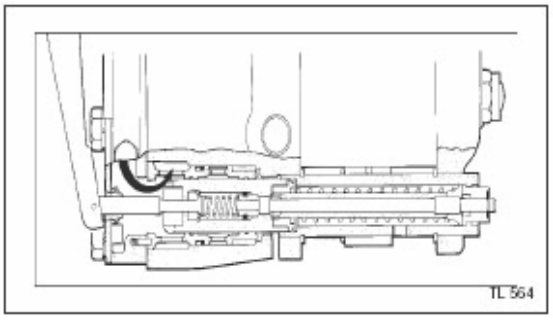


Fig 3

Fig. 4, shows the valve in its neutral position, the intake and discharge slots being outside the ports in the sleeve. In this position, the lift arms would be stationary.

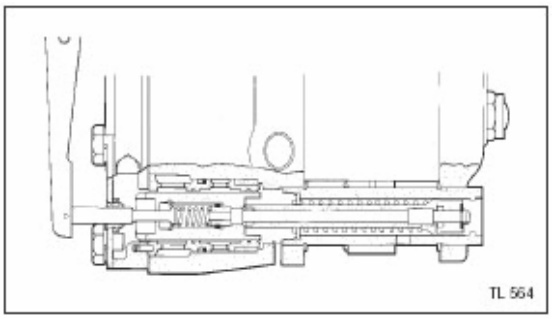


Fig 4

In Fig. 5, the valve is in its discharge position. The discharge slots are open to the pressure chamber allowing oil to flow from the ram cylinder back to sump. In this position, the lift arms would be lowering.

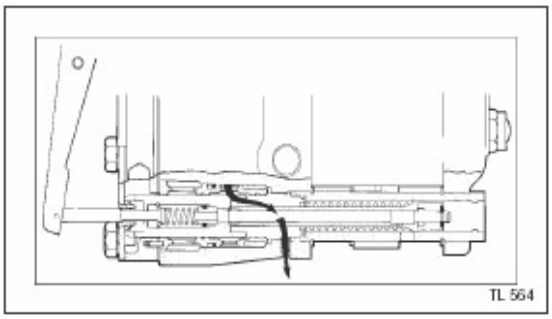


Fig 5

Response Control (Fig. 6):

The principle components of the Response Control mechanism are a non-return valve within the pump intake gallery and an oil discharge orifice, the effective size of which is varied by a slide valve.

Whenever the pump control valve moves to the discharge position it displaces oil from the intake gallery (1). The oil is prevented from returning through the intake filter by the non-return valve (2) and is therefore forced to escape through the orifice (3). Altering the Response Control setting moves the slide valve (4) which varies the size of the orifice and consequently the rate of oil discharge from the gallery. This, in turn, determines the speed at which the control valve moves to discharge and the rate at which the implement lowers.

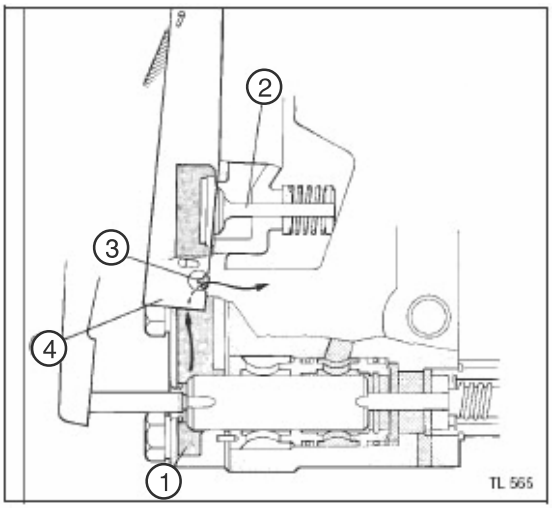


Fig 6

Operation Draft Control - implement lowering. (Fig. 7).

To lower the implement, place the Position Control lever in the Transport position, and move the Draft Control lever down the quadrant. This action presses the eccentric roller (1), on the end of the Draft Control lever shaft, down onto the upper cam face of the Draft Control cam (2), causing the lower face of the cam (2) to be forced downwards into contact with the roller (3) on the Draft Control linkage. The cam (2) is then moved rearward causing the vertical lever (4) to pivot and move the pump control valve, via the lever (5), into the discharge position against the influence of the control valve spring. The Draft Control linkage will move because the force from the control valve is less than the breakout spring (6) force.

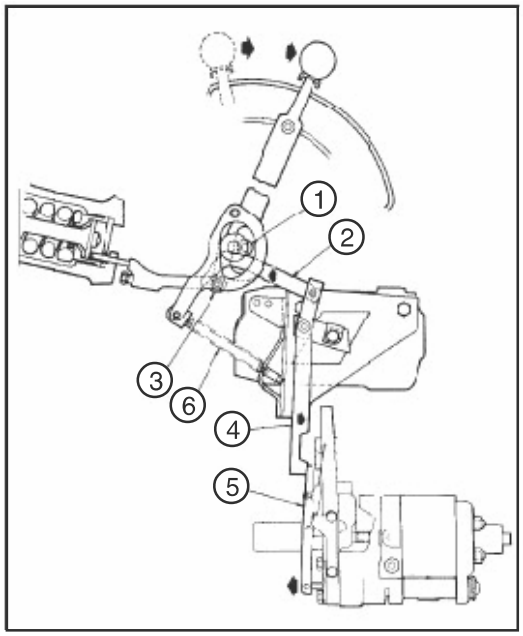


Fig 7

Draft Control - compression force in the top link.(Fig. 8).

When the control valve is in the full discharge position, and with further downward movement of the Draft Control lever, the eccentric roller (3) acting on the upper cam face of the Draft Control cam (4), forces the lower cam face of the Draft Control cam (4) to move the roller (5) forwards. Forward movement of the roller (5) leaves a gap between the Draft Control rod (2) and the Draft Control spring plunger and simultaneously compresses the breakout spring on the guide rod (7). Forward movement of the tractor will cause an implement to gain depth because the control valve is in the discharge position. This will continue until the resultant implement draft reaction compression forces, applied through the top link, deflect the control spring. This causes the Draft Control spring plunger to contact the Draft Control rod (2), and move the Draft Control linkage forwards, acting under the influence of the control valve spring and limited by the position of the roller (5), until the control valve reaches the neutral position.

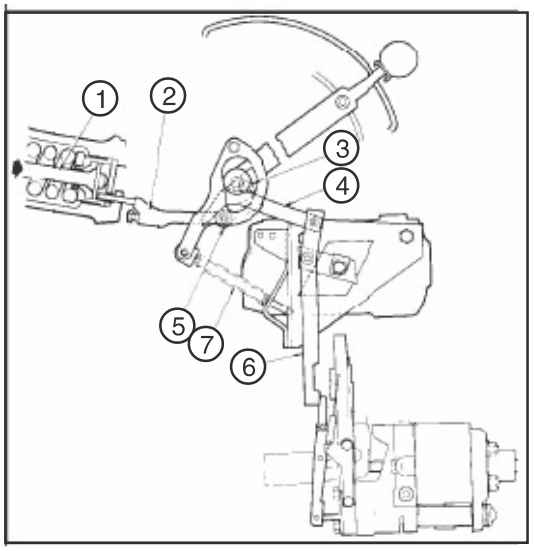


Fig 8

Draft Control - tension force in the top link (Fig. 9).

Variations in ground conditions will cause fluctuations in the draft force in the top link. If the draft force decreases, the compression force in the control spring decreases. The Draft Control linkage follows the control spring plunger under the influence of the breakout spring in the guide rod (7), and moves the Draft Control link rearwards. The vertical lever (4) pivots and moves the pump control valve, via the lever (5), towards discharge. When the correct depth is obtained, the valve is restored to neutral. An increase of draft force in the top link will have an opposite effect.

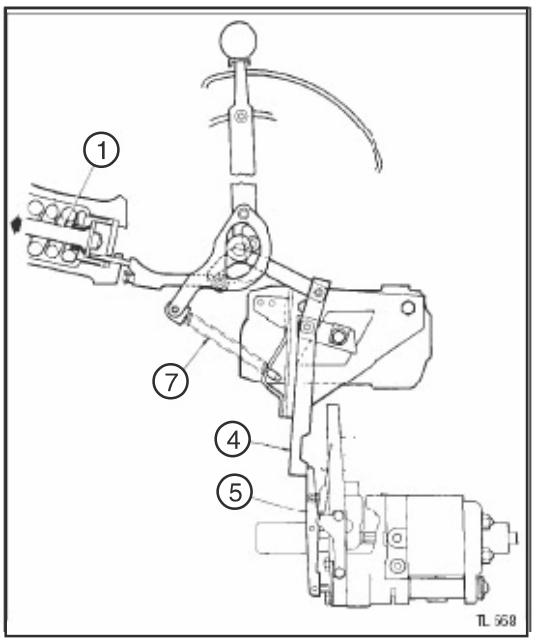


Fig.9

Position Control - implement lowering (Fig. 10).

With the Draft Control in the fully UP position downward movement of the Position Control Lever causes the eccentric roller (2) to force the cam (3) downwards. The breakout spring pushes the Position Control link (1) to maintain contact between the roller (8) and the eccentric cam on the cross shaft (9), and the front roller (6) moves the cam (3) rearwards, causing the vertical lever to pivot and move the pump control valve, via the lever (5) into the discharge position.

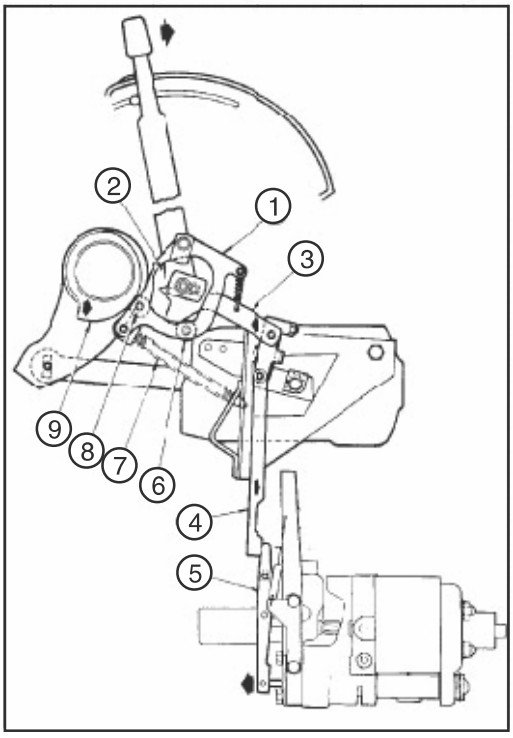


Fig.10

Position Control - implement raising. (Fig. 11).

Release of oil from the ram cylinder allows the eccentric cam on the cross shaft (5) to rotate and force the rear roller (4), mounted on the Position Control link (1), forward. This action allows the pump control valve spring to move the Position Control cam (2), which is in contact with the front roller (3), forward, until the control valve reaches the neutral position, which has been determined by the Position Control lever.

For every position that the Position Control lever is moved to, there is a position where the cam moves the control valve to neutral.

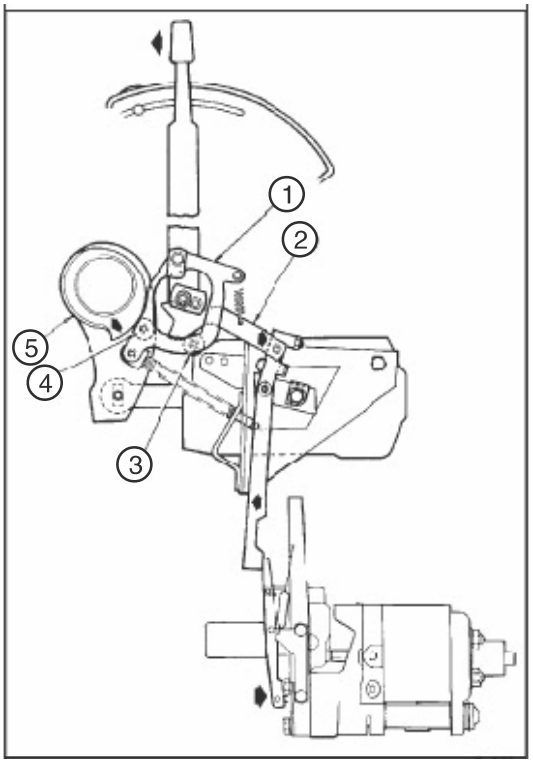


Fig 11

11A . 3 CONTROL SPRING ASSEMBLY

Removal and refitment (Refer Fig 12)

Special Tools:

MF163 - Wrench

Removal:

1. Remove the control beam.
2. Remove the hexagon socket screw.
3. Pull back the rubber boot.
4. Using MF.163, unscrew the retainer from the lift cover.
5. Withdraw the control spring assembly from the lift cover.
6. Remove and discard the nylon plug.

Refitment:

7. Reverse procedures 1 to 6, except:
   a. With the Draft Control lever in the fully DOWN position, tighten the retainer, until the end-float is eliminated. Do not over-tighten otherwise the end float will reappear.
   b. Fit a new nylon plug.
   c. Tighten the hexagon socket screw to a torque of 5 lbf.ft (7 Nm).

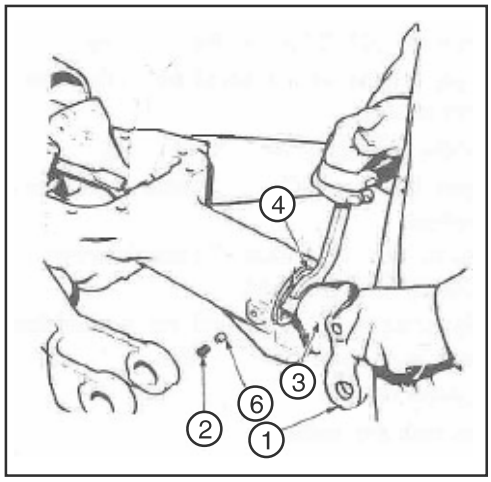


Fig 12

11A . 4 CONTROL SPRING ASSEMBLY

Overhaul (Refer Fig 13)

Special Tools:

MF163 Wrench

Dis-assembly

1. Remove the control spring assembly, see operation 11A . 3
2. Drive out the pin.
3. Unscrew the head using MF.163 wrench
4. Remove the retainer.
5. Remove the spring.
6. Remove the spring seat.

Re-assembly

7. Reverse procedures 1 to 6, except:
   a. Screw the plunger into the head until the end-float is eliminated and the spring is tight to turn by hand.
   b. Fit a new pin.

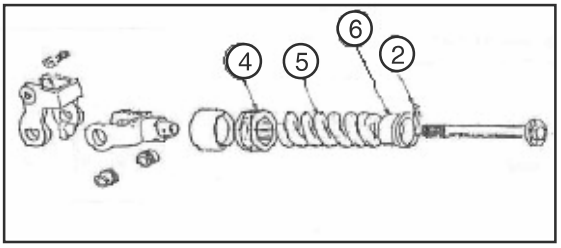


Fig 13

11A . 5 HYDRAULIC LIFT COVER

Removal and refitment (Refer fig 14 , 15 ,16)

Special Tools:

MF226C Lift cover remover/replacer

Removal

1. Disconnect the lift rods from the lift arms.
2. Remove the control beam.
3. Place the Draft Control lever in the fully DOWN position.
4. Remove the two bolts and washers.
5. Remove the cap and stand-pipe,
6. Place the Draft Control lever in the fully UP position and the Position Control lever in the Transport position and lock in position.
7. Remove the lift cover bolts.
8. Using MF.226C carefully hinge back the lift cover and place the support leg on the ground.
9. Remove and discard the lift cover gasket.
10. Drain the oil to the LOW mark on the dipstick.
11. Remove the screws attaching the Response Control cover plate.
12. Remove the response cover plate.
13. Remove the four bolts and one screw attaching the right-hand side cover to the centre housing.
14. Disconnect the Constant Pumping control rod, if fitted. Remove the side cover.
15. Remove and discard the side cover gasket.

Refitment

16. If any work has been carried out on the lift cover, carry out the static adjustments before refitment
17. Clean the surfaces of the centre housing and lift cover.
18. Reverse procedures 1 to 15 except:
    a. DO NOT replace the lift cover gasket. Coat the face of the centre housing and lift cover with MF Instant Gasket (Loctite 509, 5204 or 5205).
    b. Take care, when refitting the lift cover that the vertical lever does not foul any of the internal components.
    c. Do not forget to fit the stand pipe and cap.
    d. Tighten the lift cover bolts to a torque of 65 lbf. (88 Nm).
    e. Tighten the Transfer cap retaining bolts to a torque of 32 lbf.ft (44 Nm).
19. Carry out external adjustments, see operation 11A . 10.

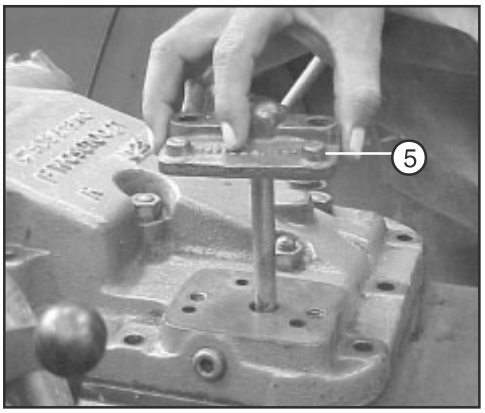


Fig 14

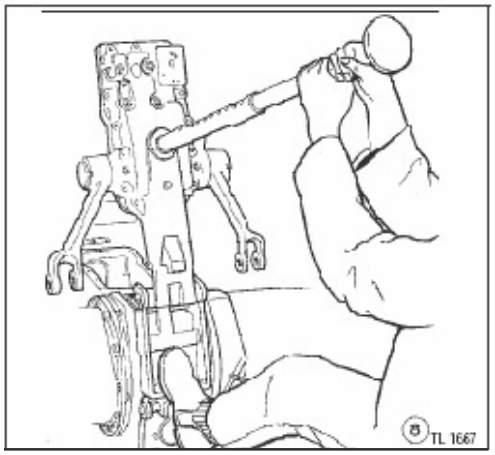


Fig 15

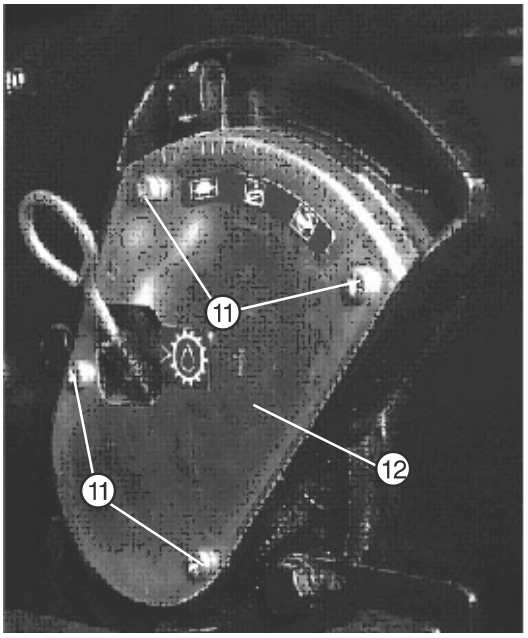


Fig 16

11A . 6 HYDRAULIC LIFT COVER

Overhaul: (Refer 17 to 23)

Dis-assembly:

1. Remove the lift cover, See operation 11A . 5
2. Release the tabwasher.
3. Remove the nut.
4. Remove the tabwasher.
5. Remove the spacer.
6. Release the spring.

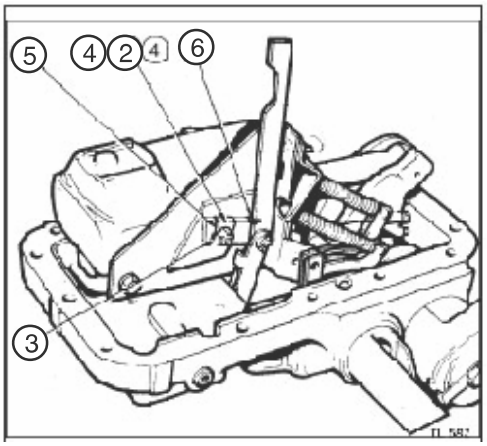


Fig 17

7. Release the slide pivot from the bolt.
8. Remove the spring.

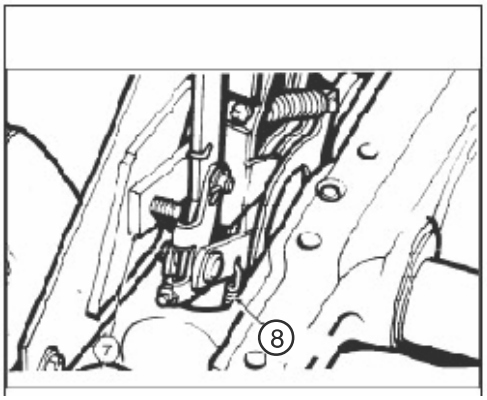


Fig 18

9. Fit a pair of pins to retain the springs.
10. Remove the four nuts securing the ram cylinder to the lift cover.
11. Lift off the ram cylinder.

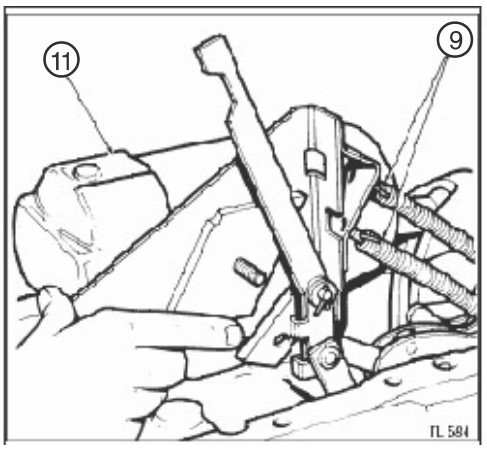


Fig 19

12. Remove and discard the 'O' ring.
13. Remove the connecting rod.
14. Remove the hexagon socket screw. On later models the hexagon socket screw is replaced by a roll pin.
15. Remove the hexagon socket plug.
16. Remove the screw.
17. Screw a Number 10-32 UNF bolt into the pin and remove the pin.

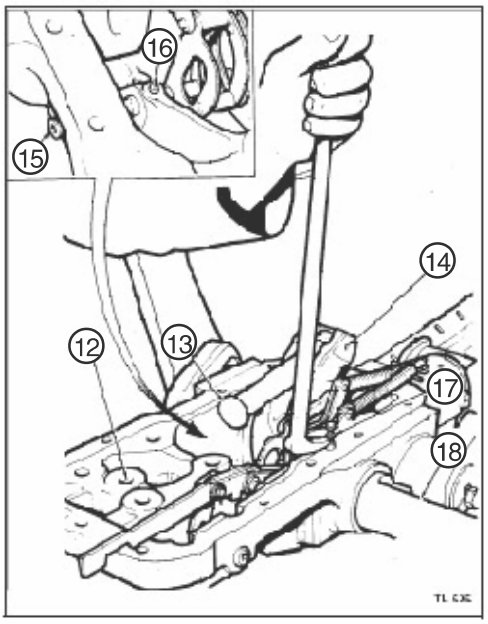


Fig 20

18. Withdraw the quadrant control support assembly, simultaneously lifting out the vertical lever and the cams.
19. Remove the shim(s), if fitted.
20. Remove the Belleville washer.

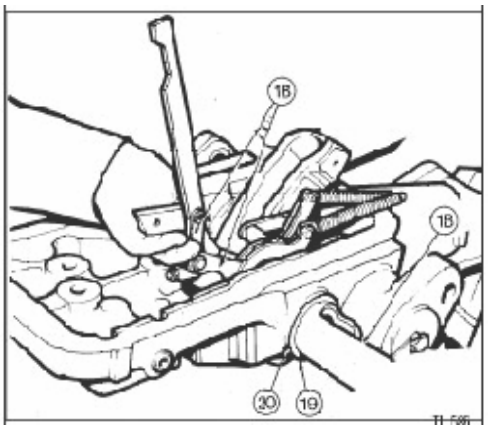


Fig 21

21. Withdraw the pivot shaft.
22. Lift out the links.
23. Release the tabwasher.
24. Remove the bolt and washer.
25. Slide off the lift arm.
26. Remove and discard the 'O' ring.
27. Release the tabwasher.
28. Remove the bolt and washer.
29. Slide off the lift arm.
30. Remove the 'O' ring, see procedure 26.
31. Drive the lift shaft out of the lift cover.
32. Remove the ram arm.
33. Remove the two bushes.

Re-assembly

34. Reverse procedures 1 to 33, except:
    a. Fit new bushes if necessary.
    b. Fit new 'O' rings and tab washers.
    c. Align the master spline when refitting the shaft and the two lift arms.
    d. Fit the Belleville washer with the concave side towards the lift cover.
    e. Ensure that the pivot shaft is fully located against the side of the lift cover before tightening the hexagon socket screw.
    f. When refitting the connecting rod hexagonsocket screw, apply a drop of MF Lock and Seal (Loctite 542) or equivalent to the threads, and screw the hexagon socket screw into the ram arm until the screw bottoms on the annular groove in the connecting rod, then back it off 1/4 turn.
    g. When refitting the ram cylinder, locate the connecting rod in the piston and the two rods in the holes in the bracket.
    h. Tighten the front ram cylinder retaining nuts to a torque of 162 lbf.ft (220 Nm) and the rear retaining bolts to a torque of 225 lbf.ft (305 Nm).
35. Carry out hydraulic static adjustments, see operation 11A . 9.

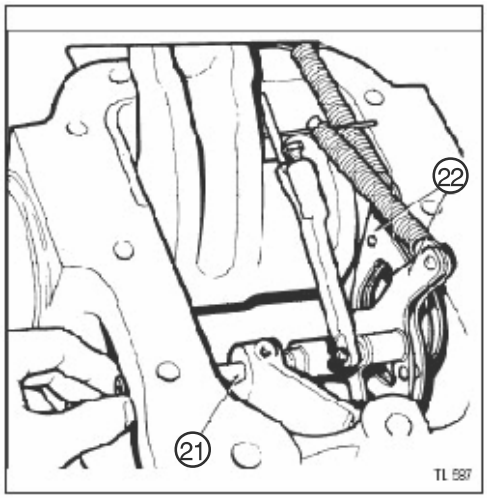


Fig 22

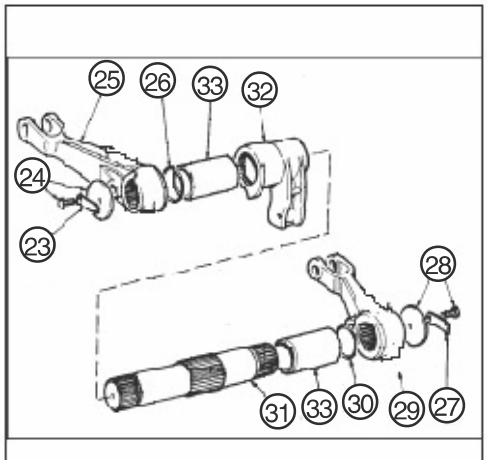


Fig 23

11A . 7 HYDRAULIC LIFT CYLINDER

Overhaul

Special Tools:

MF420 Piston seal replacer 3.110 inch (79 mm).

Dis-assembly

1. Remove the lift cylinder assembly, See operation 11A . 6, procedures 1 to 11.
2. Remove the two bolts.
3. Remove the support bracket.
4. Withdraw the piston from the cylinder.
5. Remove the piston seal and 'O' ring if necessary.

Examination

Examine all components for wear or damage, replacing any defective components.

Re-assembly

6. If piston seals have been removed apply transmission oil to 'O' ring part of seal and fit it into the piston groove.
7. Lubricate the outside of the tapered guide of MF.420 for the MF.2605/2615 tractors, with mineral oil. Place the guide on a firm, flat surface. Locate the seal on the guide and very carefully push the seal down the taper of the guide until it protrudes beyond the end. Locate the lip of the seal on the piston at the closed end. Push the seal off the guide onto the piston and into the groove on top of the 'O' ring.
8. Push the piston into the wide bore end of the sizing ring. Push it through until it protrudes approximately 0.472 inch (12 mm) from the end of the ring.
9. Lubricate the bore of the cylinder with transmission oil, then locate the protruding portion of the piston in the mouth of the cylinder bore. Push the piston through the sizing ring and into the cylinder.
10. Reverse procedures 1 to 11 in operation 11A . 6.

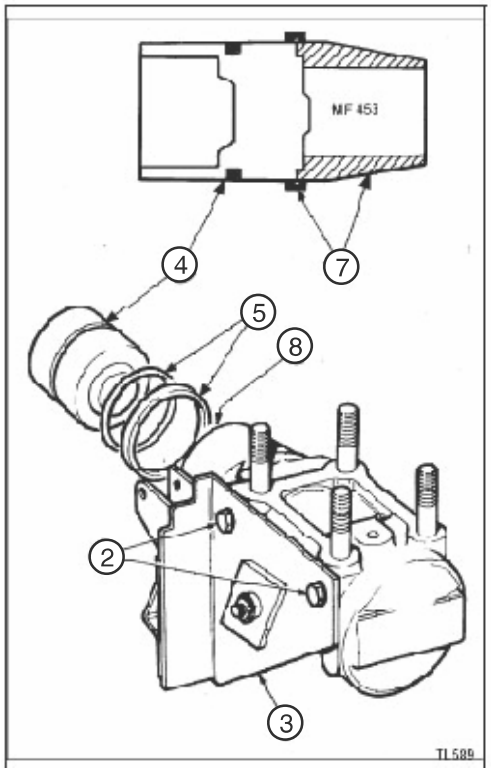


Fig 24

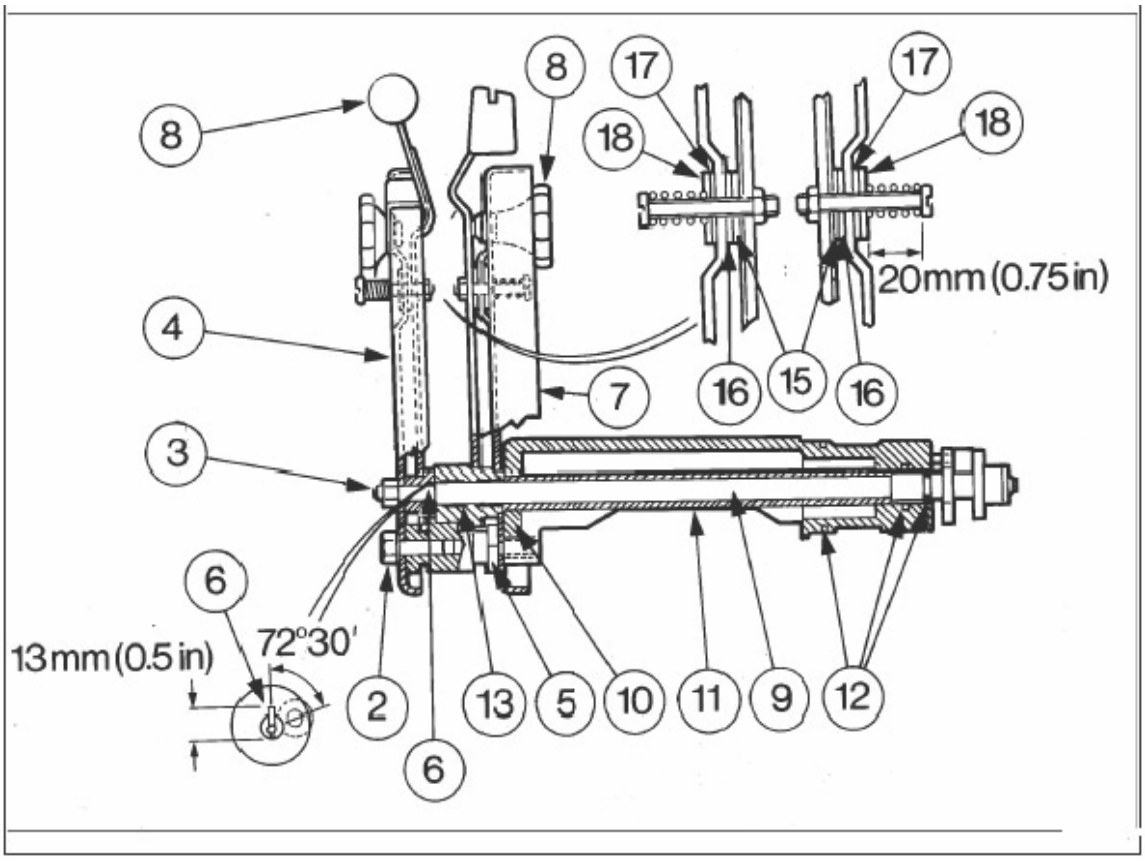


Fig 25

11A . 8 QUADRANT AND SUPPORT ASSEMBLY

Overhaul

Dis-assembly

1. Remove the quadrant control support assembly, see operation 11A . 6, procedures 1 to 12 and 17 to 20.
2. Remove the two bolts and washers.
3. Remove the nut.
4. Remove the outer quadrant complete with lever.
5. Remove the two spacer bolts.
6. Drive out the pin.
7. Remove the inner quadrant complete with the lever.
8. If necessary, remove the levers and the stop knobs.
9. Withdraw the Draft Control shaft.
10. Remove the circlip.
11. Withdraw the Position Control shaft.
12. Remove the 'O' rings.
13. Remove the bush.

Re-assembly:

14. If necessary, refit the levers and the stop knobs to the quadrant. Assemble the washers in the order shown in the following procedures 15 to 19.
15. Fit the steel washers.
16. Fit the polyurethane washer with the shiny side against the quadrant.
17. Fit the nylon washers.
18. Fit the steel washers.
19. Tighten the screws to give a clearance of approximately 0.787 inch (20 mm) between the screw head and the steel washer.
20. Reverse procedures 1 to 13 except:
    a. Do not overtighten the Draft Control shaft nut and locknut as the roller will not turn freely.
    b. Refit the pin (procedure 6) with the shaft and roller in the position shown and protruding approximately 0.511 inch (13 mm) from the shaft.

11A . 9 HYDRAULIC STATIC ADJUSTMENTS

Adjust

Special Tools:

MF163	Spring retainer nut wrench
MF272	Ram arm gauge
MF333	Draft Control rod gauge
MF356C	Position and Draft Control setting gauge
MF273 A	Hydraulic control lever setting fixture

Control spring internal end-float:

1. Remove the locking pin.
2. Screw the plunger into the yoke until all the end-float has been removed and the spring is tight to turn by hand.

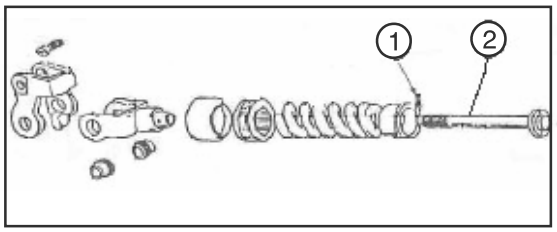


Fig 26

Control Spring external end-float :

1. Ensure that the Draft Control rod cannot obstruct the control spring plunger by fitting a suitable wedge between the draft rod adjusting bolt and the lift cover casting. If the lift cover is fitted, move the Draft Control lever to the fully lowered position.
2. Refit the spring assembly into the lift cover housing and using MF.163, tighten the retaining nut until the end float in the spring assembly has been removed. Do not over tighten as this will compress the spring and cause the end-float to return.
3. Tighten the hexagon socket screw to a torque of 5 lbf.ft (7 Nm).
4. Remove the wedge.

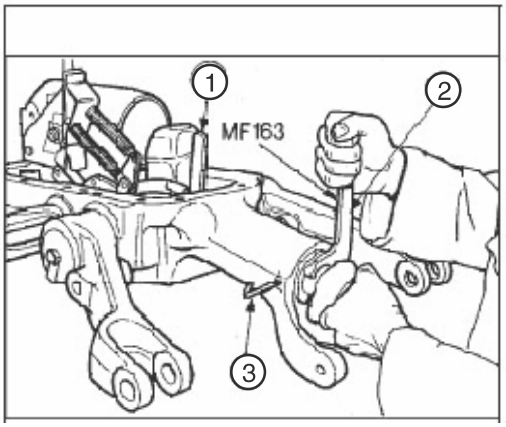


Fig 27

Lift arm end float adjustment

1. Release the tabwasher.
2. Slacken the bolt.
3. Release the tabwasher.
4. Fully tighten the bolt.
5. Secure the bolt and the tabwasher.
6. Tighten the bolt, until the lift arms will move freely throughout their range, but without end float.
7. Secure the bolt with the tabwasher.

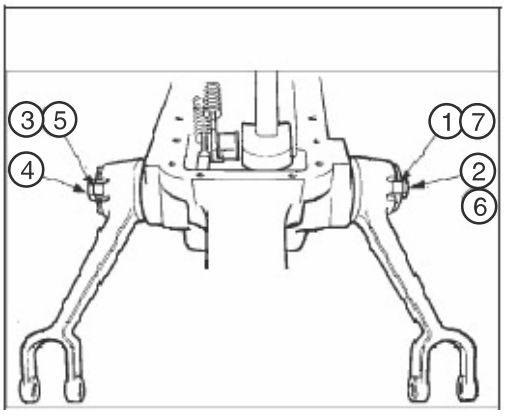


Fig 28

Quadrant location:

1. Slacken the two bolts.
2. Slacken the two barrel nuts.
3. Locate the inner quadrant in the centre of the elongated hole.
4. Tighten the two barrel nuts.
5. Locate the outer quadrant in the centre of the elongated hole.
6. Tighten the two bolts.

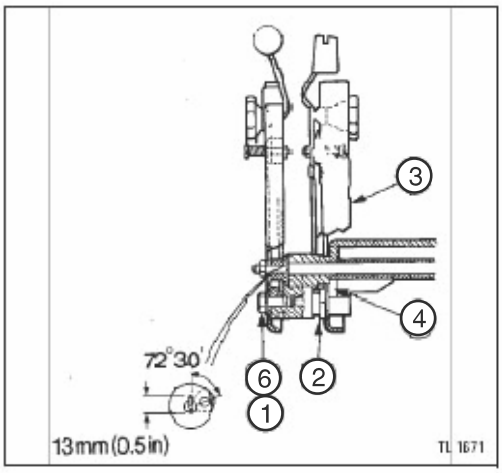


Fig 29

Draft Control rod adjustment

1. Place the Draft Control lever in the UP position.
2. Place the Position Control lever in the Transport position.
3. Using MF.333, adjust the set screw to give a clearance of 0.228 inch (5.8 mm) between the set screw and the lift cover casting.

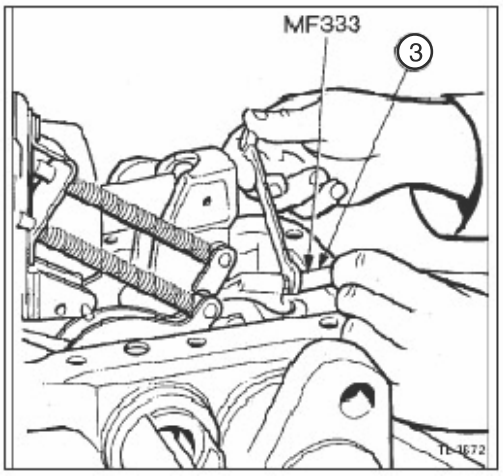


Fig 30

Draft Control neutral setting

1. Slacken the locknut.
2. Slacken the hexagon socket grub-screw and locknut on the vertical lever to the end of its thread. This will ensure that no interference from the Position Control linkage takes place.
3. Release the tabwasher.
4. Slacken the nut.
5. Position MF.273 A on the lift cover.
6. Apply a load of 1.3 kg (2.86 lbs) to the end of the vertical lever. This simulates the force of the linkage pump control spring (a spring balance can be used if no tool is available).
7. Locate MF.356C on the lift cover
8. Place the Draft Control lever in the Sector position.
9. Place the Position Control lever in the Transport position.
10. Adjust the slide pivot, until the vertical lever just touches the pin on MF.356C.
11. Tighten the nut.
12. Re-check the setting.
13. Secure the nut with the tabwasher.

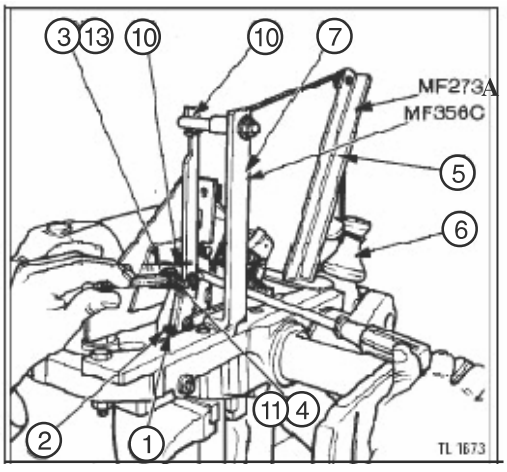


Fig 31

Position control neutral (Transport) setting

1. Position MF.272 on the lift cover.
2. Locate the ram arm on MF.272.
3. Place the Draft Control lever in the UP position.
4. Place the Position Control lever in the Transport position.
5. Adjust the Allen screw until the vertical lever just contacts the pin on MF.356C.
6. Tighten the locknut.
7. Re-check the setting.
8. Remove MF.272, MF.273 A and MF.356C.

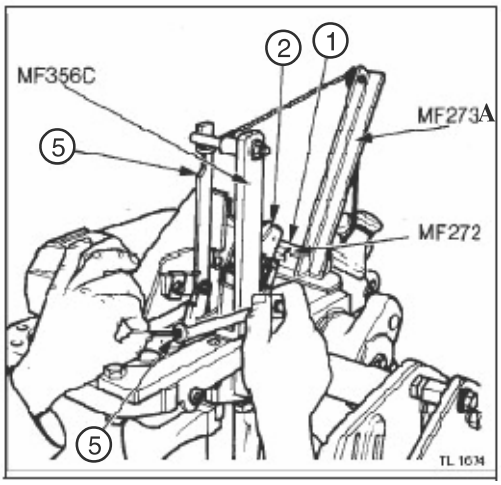


Fig 32

11A . 10 HYDRAULIC EXTERNAL ADJUSTMENTS

Adjust

Pre-conditions

1. Refit the lift cover, hydraulic unions, pipes etc.Refill the tractor with oil to the correct grade.
2. Attach a weight of 400 kg (882 lbs) to the lower links.
3. Place the Draft Control lever in the fully UP position.
4. Start the engine and set the engine speed at low idle (1200 rpm) no load, then operate the Position Control lever through the quadrant range to expel all the air from the system.
5. Warm up the engine oil in the transmission to a temperature of 120 -140 ^{O}F (50 - 60^{O}C) and then stop the engine.

Draft Control setting:

NOTE: *The top link must not be attached when carrying out this adjustment.*

1. Start the engine, and set the engine speed at 1200 rev/min.
2. Place the Position Control lever in the Transport position.
3. Using the Draft Control lever, set the lower links in the horizontal position. The Draft Control lever should be in the sector marks on the quadrant, if not carry out procedures 4 to 6.
4. Loosen the two quadrant support bolts and rotate the Draft Control quadrant and lever until the links remain stationary in the horizontal position.
5. Tighten the two bolts and recheck the setting.
6. Fully lower the links and stop the engine.

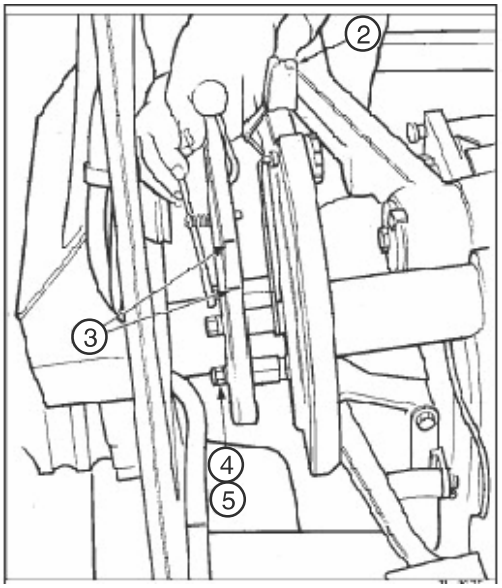


Fig 33

Position control setting

1. Start the engine, and set the engine speed at 1200 rev/min.
2. Place the Draft Control lever in the fully UP position.
3. Place the Position Control lever in the Constant Pumping position.
4. When the links are fully raised scribe a line across the lift cover casting to the lift arm.
5. Place the Position Control lever in the Transport position.
6. The links should drop until the scribe lines are 0.078 - 0.196 inch (2-5 mm) apart, if the distance is incorrect carry out procedures 7 to 10.
7. Slacken the two bolts and the two barrel nuts.
8. Rotate the Position Control quadrant and lever until the setting is correct.
9. Tighten the two barrel nuts and recheck the setting.
10. Stop the engine.

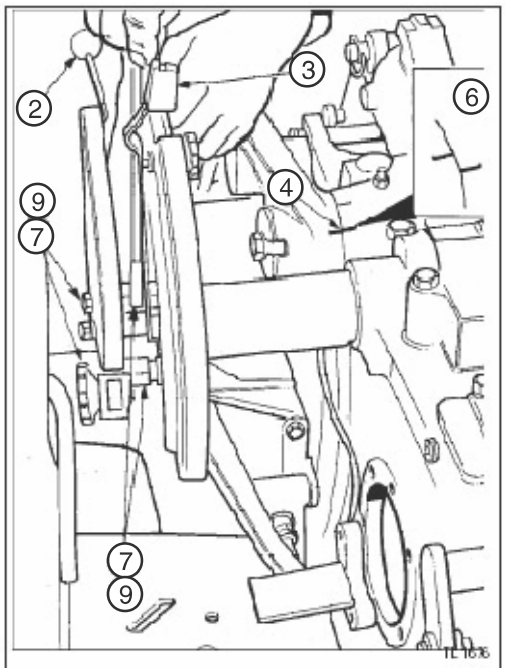


Fig 34

Response Control setting

1. Release the locking screw.
2. Place the Response Control lever 0.236 inch (6 mm) from the rear end of its quadrant.
3. Rotate the inner lever, until the cam just contacts the vertical lever on the hydraulic pump.
4. Tighten the locking screw.
5. Refit the Constant Pumping control rod, if fitted.
6. Refit the cover and secure with the four screws.
7. Add an approved oil to the transmission until the required level is reached.

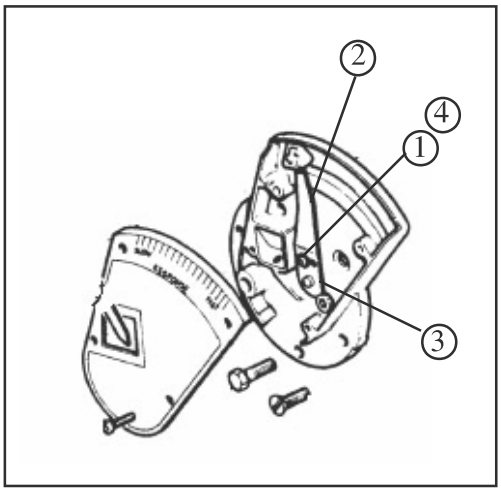


Fig 35

11A . 11 HYDRAULIC PRESSURE TEST

Check

Special Tools:

MF148B Pressure test gauge

MF3001 Pressure test kit

Procedure

1. Remove the plug from the side of the lift cover and install the 3/8 inch NPT adaptor and quick diagnostic coupling from the MF3001 pressure testing kit or alternatively, connect into the system through the trailer tipping pipe self sealing coupling.
2. Use the 300 bar (5000 psi)gauge in the test kit.
3. Move the Draft Control lever to UP position and the position control lever to Transport position.
4. Start the engine and run at 1200 rev/min. The transmission oil must be at 120-140^{O}F (50-60^{O}C).
5. Move the Position Control lever to Constant Pumping.
6. The system pressure should be: MF.2605/2615 tractors 190 - 225 kg/cm^{2} (2702 - 3200 psi)
9. If the pressure setting is incorrect, the relief valve is accessible through the right-hand centre housing side cover.

Alternative

9. Connect pressure gauge MF.148B (300 bar / 5000 psi)to the connection on the lift cover.
10. Test the system as described in procedures 3 to 8.

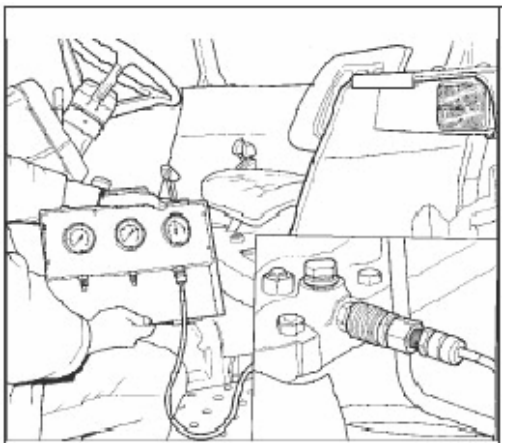


Fig 36

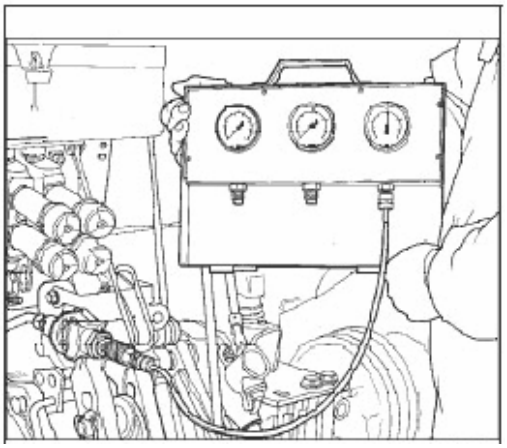


Fig 37

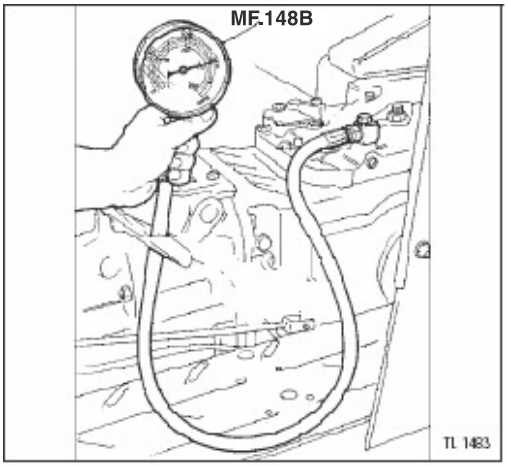


Fig 38

11A . 12 HYDRAULIC LIFT PUMP

Removal and refitment

Removal

Tractors fitted with single speed (540 rev/min) ground speed PTO only.

1. Remove the lift cover. See operation 11A . 5.
2. Drain the transmission oil.
3. Remove the left-hand side cover.
4. Remove the right-hand side cover.
5. Remove the shear tube split pin and discard it.
6. Remove the shear tube and the rear drive shaft.
7. Remove the PTO shaft. See operation
8. Remove the two nuts and dowel pins each side of the transmission case holding the lift pump.
9. Manoeuvre the lift pump out of the top of the centre housing.
10. Remove the coupler.

Refitment

11. Reverse procedures 1 to 10 except:
    a. Fit new split pins, 'O' rings and gaskets.
    b. Fit new shear tube split pin to give 0.014 - 0.100 inch (0.38-2.54 mm) end float.

Tractors fitted with single speed (540 rev/min) IPTO.

Removal

1. Remove the lift cover.
2. Drain the transmission oil.
3. Split the tractor between the centre housing and the gearbox, spacer or transfer gearbox, See operation 4A - 4.
4. Remove the right-hand side cover.
5. Remove the two nuts and dowel pins each side of the transmission case holding the lift pump.
6. Withdraw the lift pump from the front of the centre housing.

Refitment

7. Reverse procedure 1 to 6 except:
    a. Locate the lift pump on to the IPTO clutch if fitted.
    b. Fit new split pins, 'O' rings and gaskets.
    c. Refit the right-hand dowel pin (8) and tighten the two nuts. Fit the left-hand dowel and leave the nuts loose. After re-assembly of the tractor turn the transmission over on the starter motor (stop control out). Fully tighten the left-hand dowel nuts. This procedure is to ensure that PTO and pump shafts are in line.

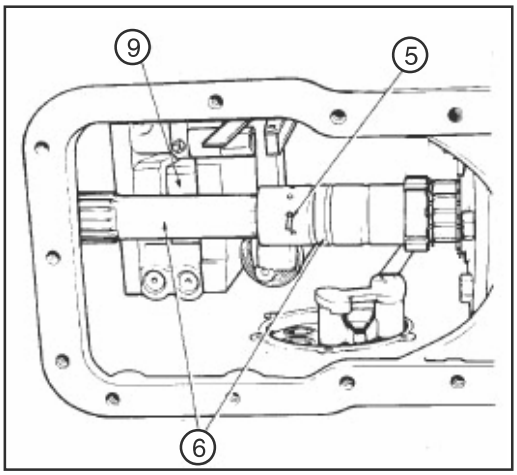


Fig 39

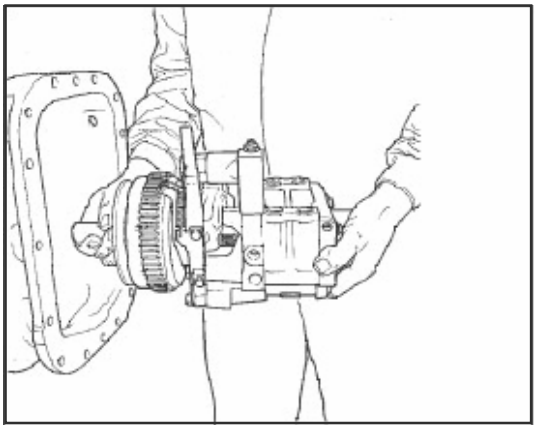


Fig 40

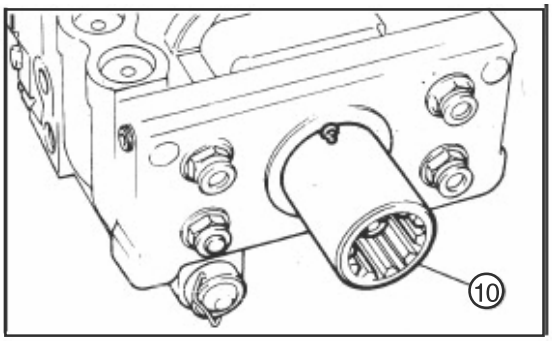


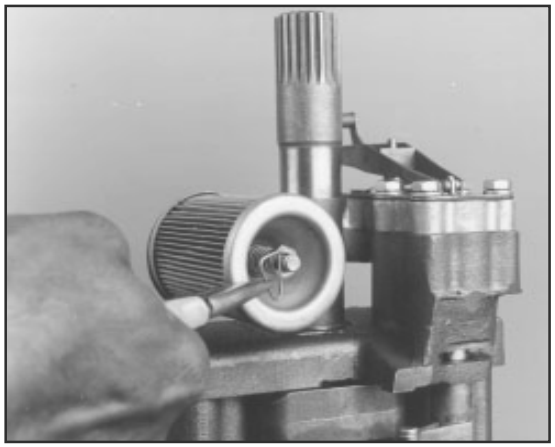
Fig 41

11A. 13 HYDRAULIC PUMP (MARK III)

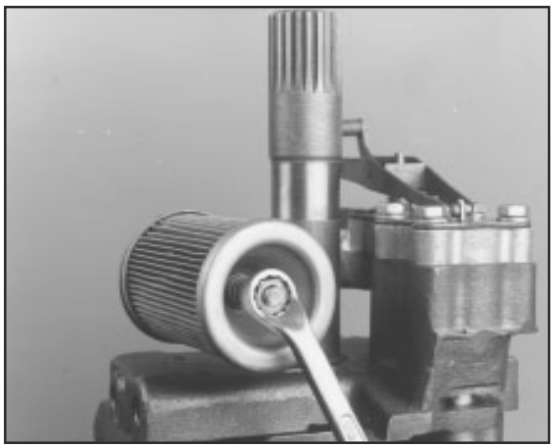
Dis-assembly

1. Remove the hydraulic pump and keep it vertical.

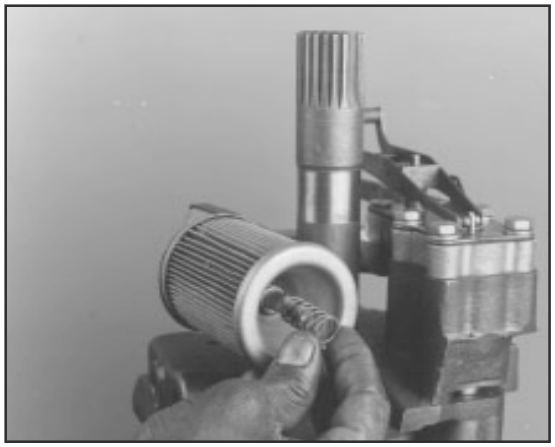
2. Clean the outside of the pump.



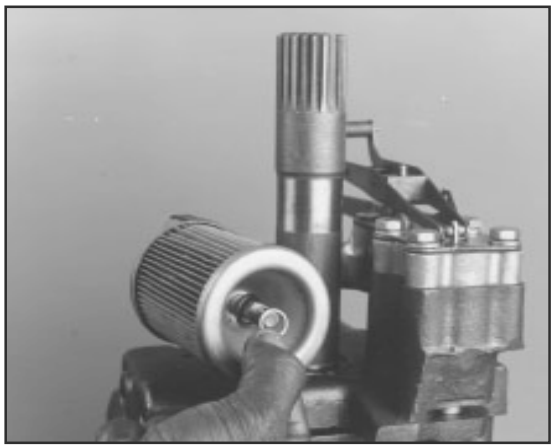
3. Remove the safety clip (fig 42).



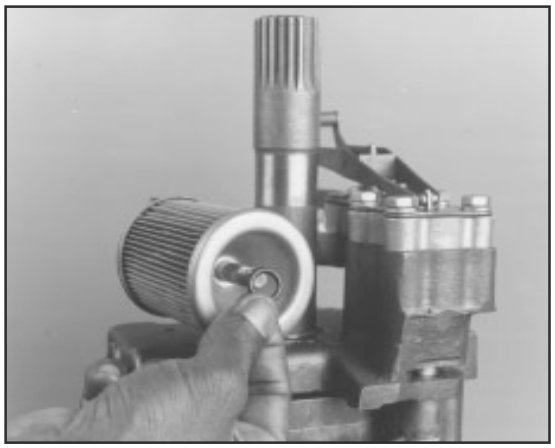
4. Remove the lock nut (fig 43). **(14 mm)**



5. Remove the spring (fig 44).

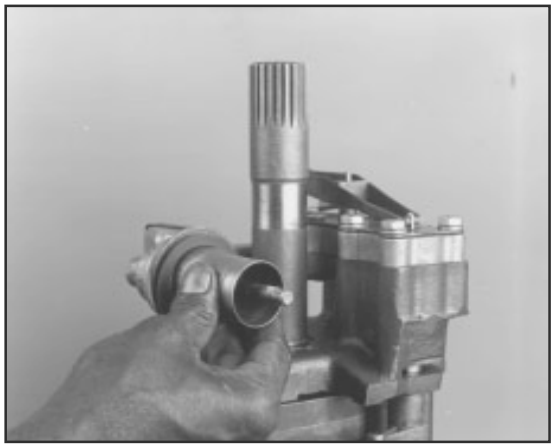


6. Remove the washers (fig 45).

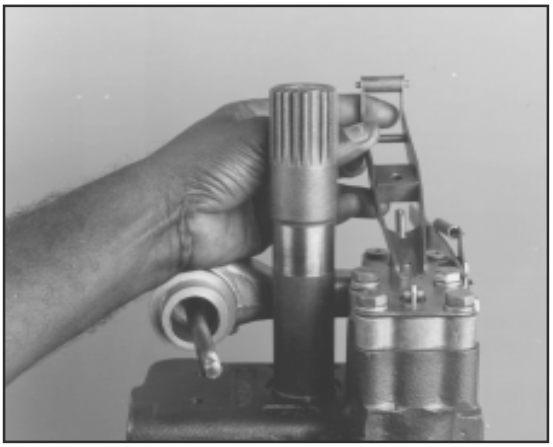


7. Remove the “O” ring and discard it (fig 46).

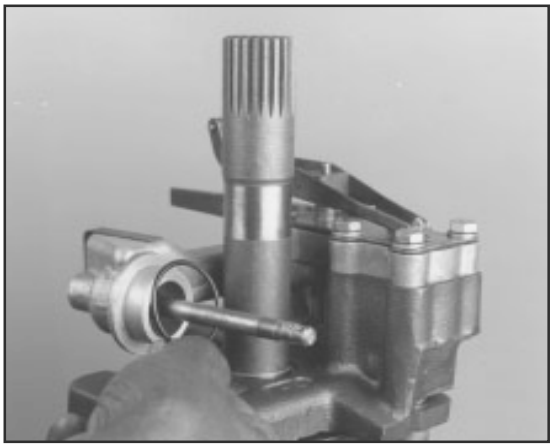
8. Remove the strainer (fig 47).



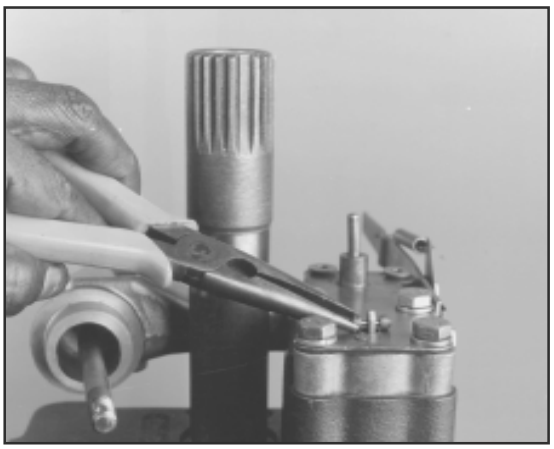
9. Remove the strainer inner shroud (fig 48).



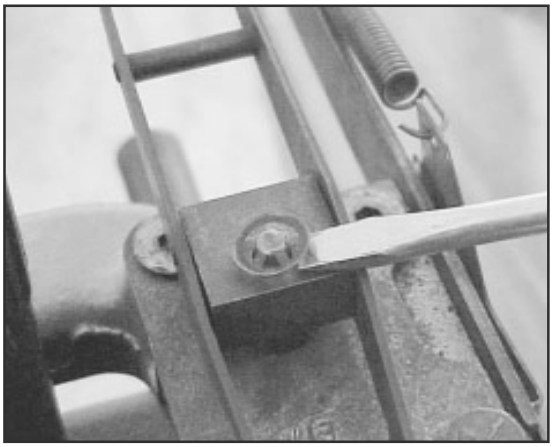
12. Remove the lever (fig 51).



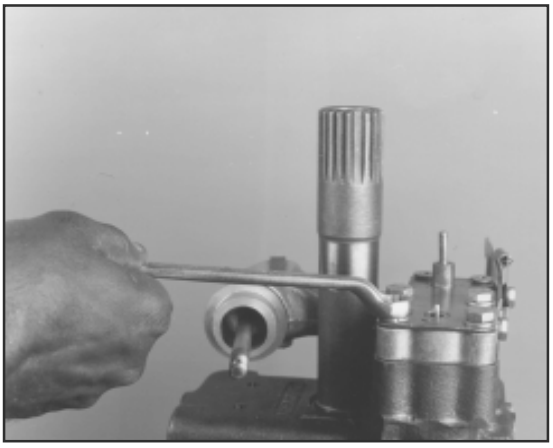
10. Remove the "O" ring and discard (fig 49).



13. Remove the two rollers and the pin (fig 52).

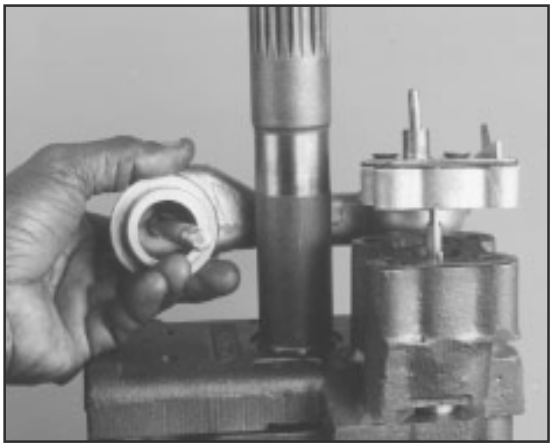


11. Remove the clip (fig 50).

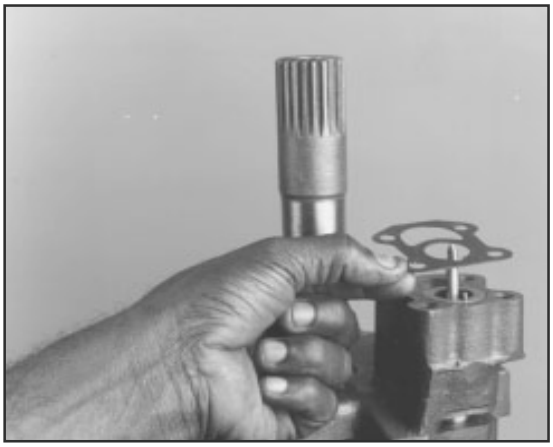


14. Remove the four lower bolts and washers (fig 53).

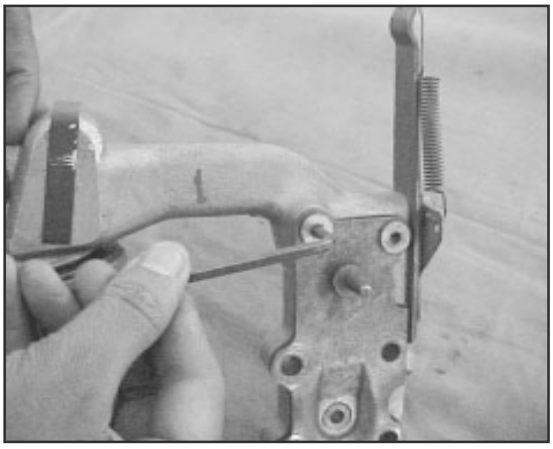
(13 mm)



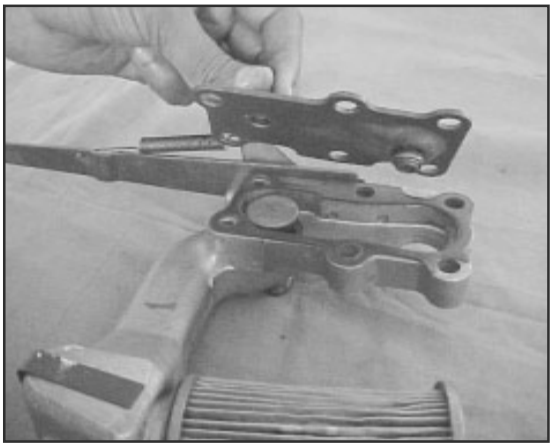
15. Remove the strainer housing (fig 54).



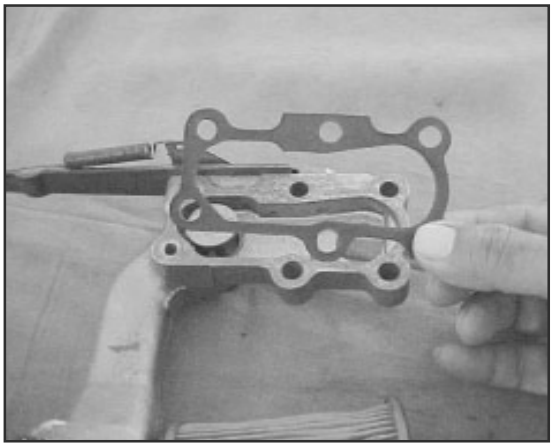
16. Remove the gasket and discard it (fig 55).



17. Remove the two allen screws (fig 56).

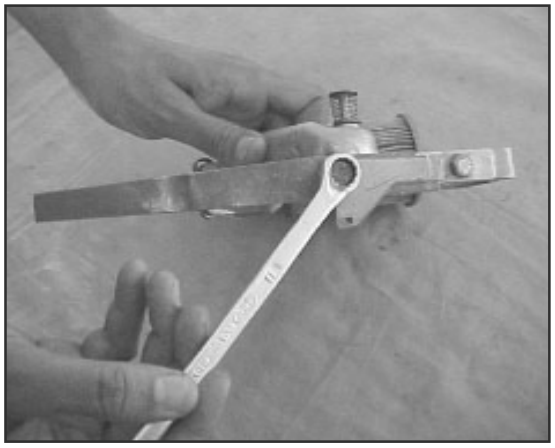


18. Remove the end plate (fig 57).

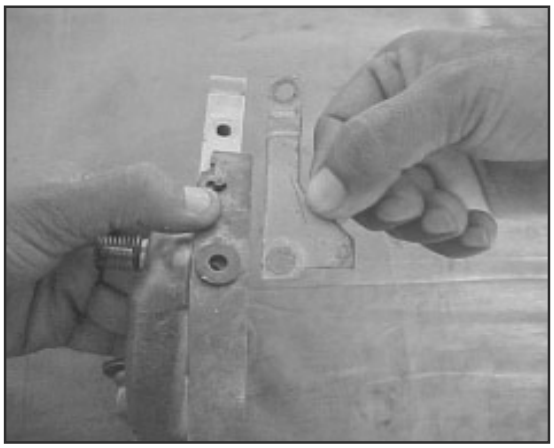


19. Remove the gasket and discard it (fig 58).

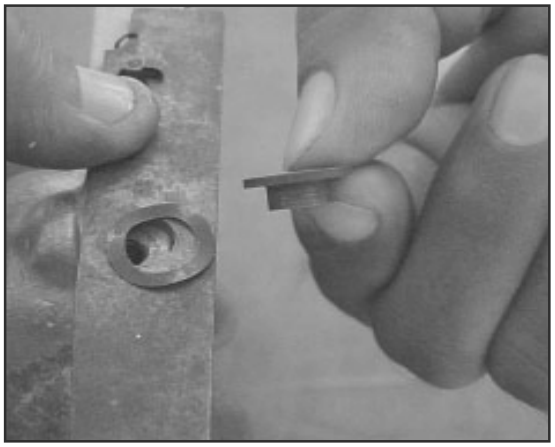
20. Remove the spring (fig 59).



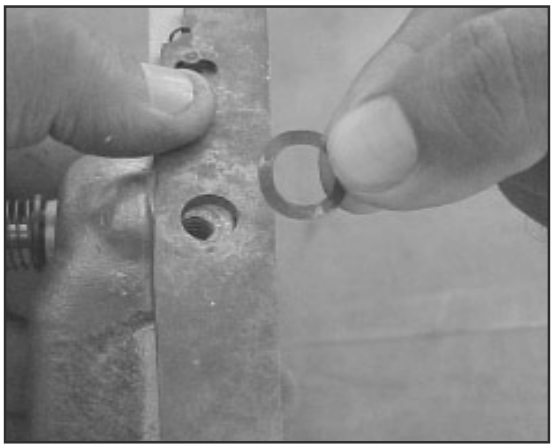
21. Remove the two bolts and washers (fig 60).
(11 mm)



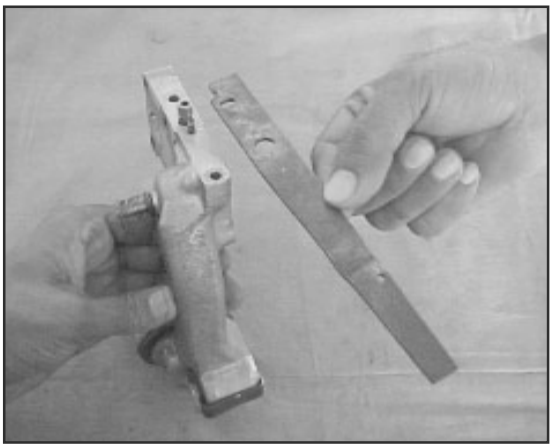
22. Remove the retainer (fig 61).



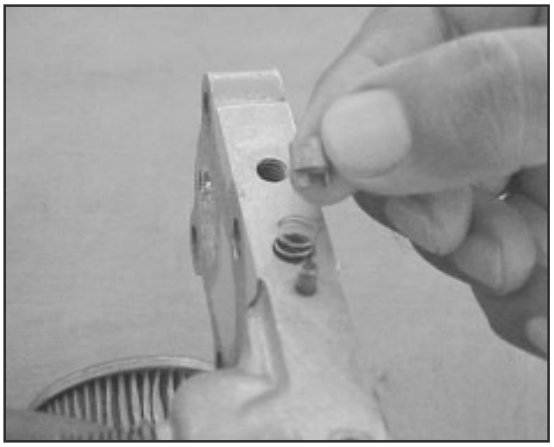
23. Remove the bush (fig 62).



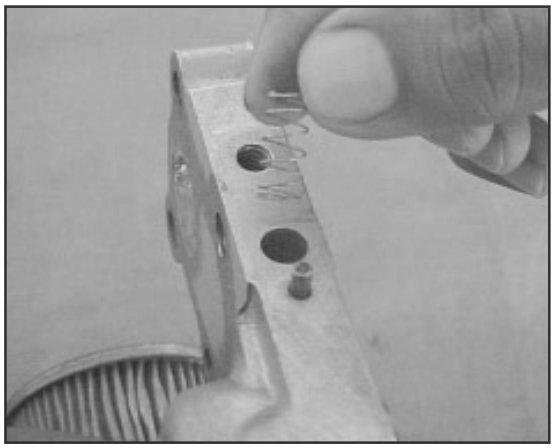
24. Remove the washer (fig 63).



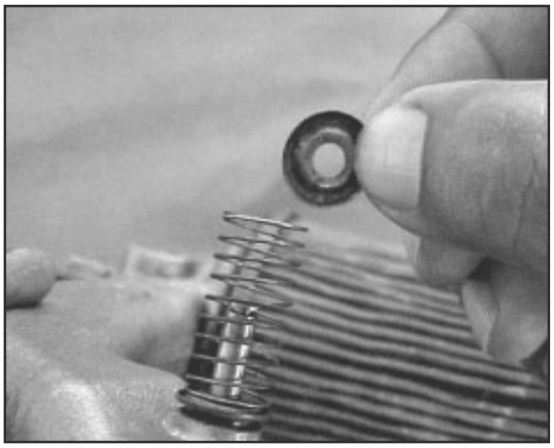
25. Remove the response control lever (fig 64).



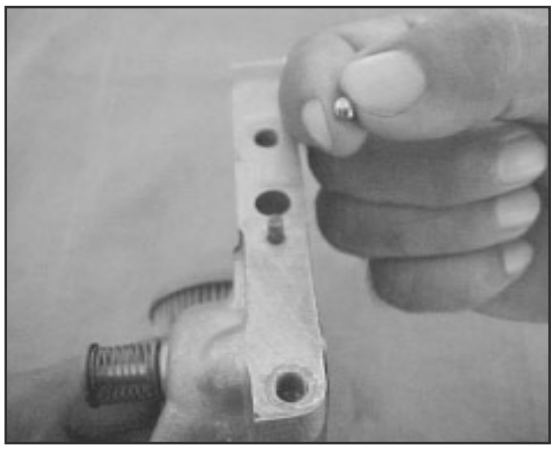
26. Remove the bush (fig 65).



27. Remove the spring (fig 66).



30. Remove the cap (fig 69).

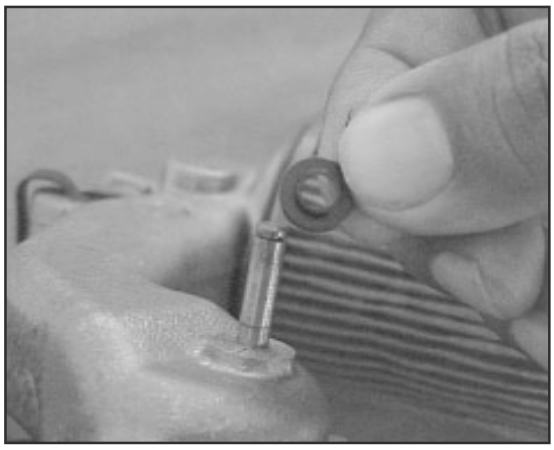


28. Remove the ball (fig 67).

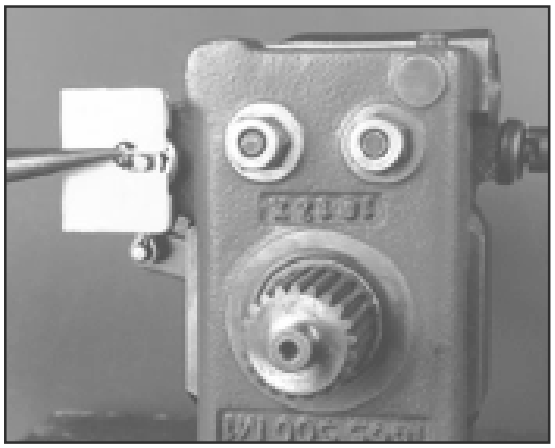
31. Remove the spring (fig 70).

29. Remove the circlip (fig 68).

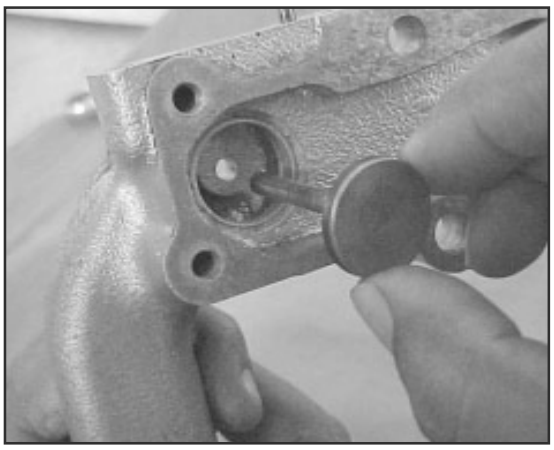
32. Remove the retainer (fig 71).



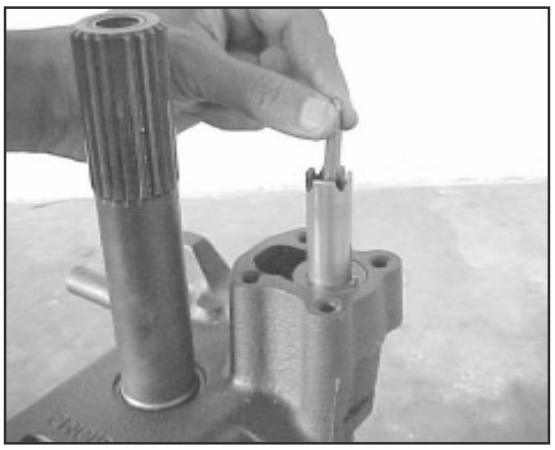
33. Remove the seal and discard it (fig 72).



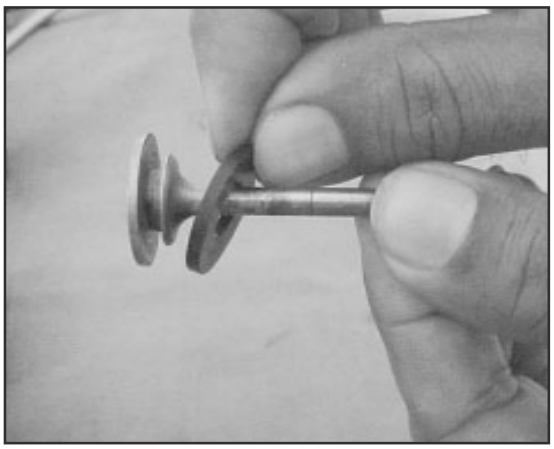
36. Remove valve spring retainer clip, slide it into position to hold back the spring tension. Remove and discard the retaining ring (fig 75)



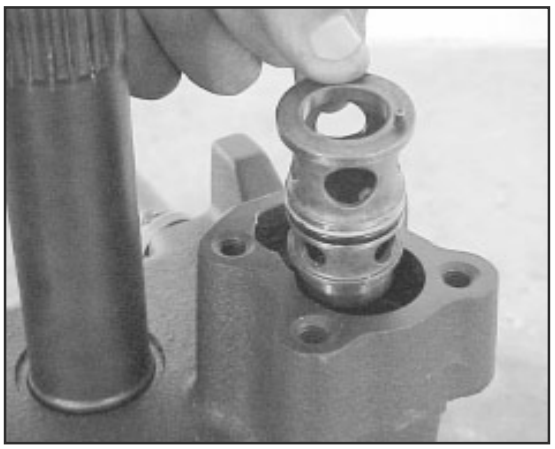
34. Remove the valve (fig 73).



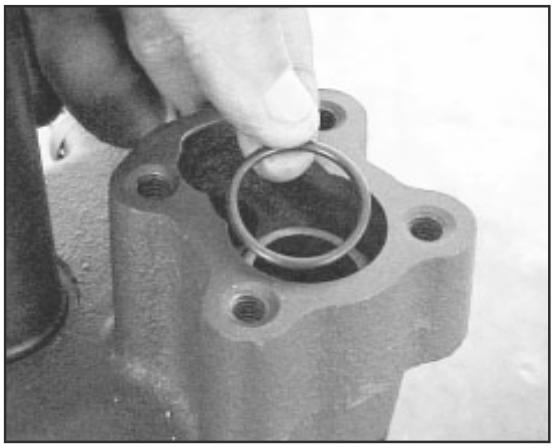
37. Withdraw the control valve (fig 76).



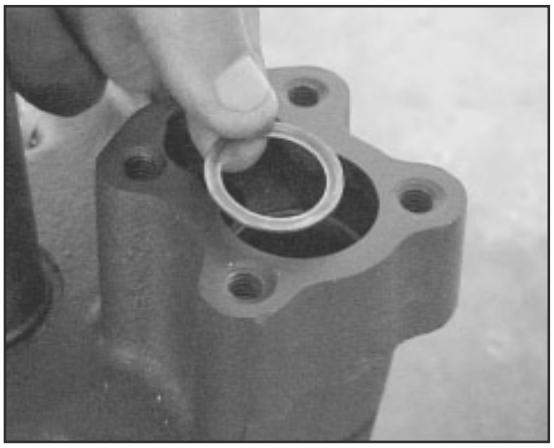
35. Remove the seal and discard it (fig 74).



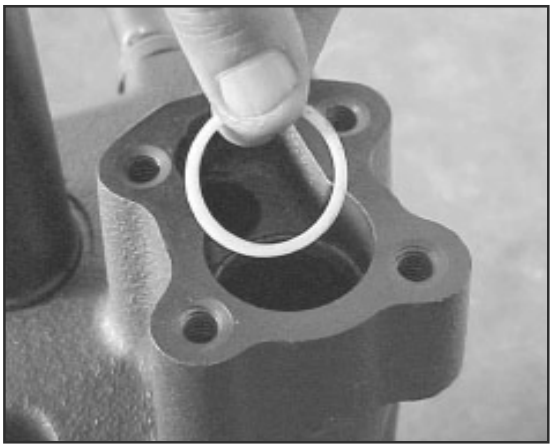
38. Withdraw the sleeve (fig 77).



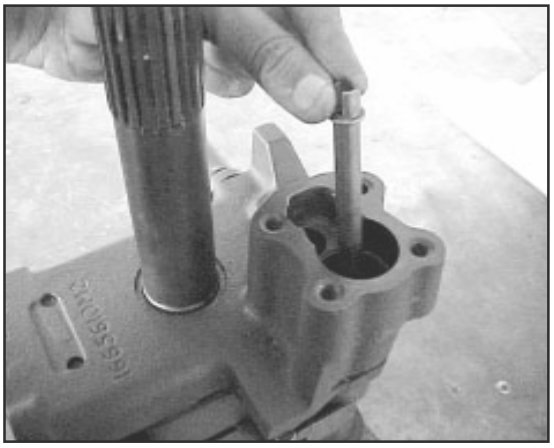
39 . Remove the “O” ring (fig 78).



42. Remove the washer (fig 81).

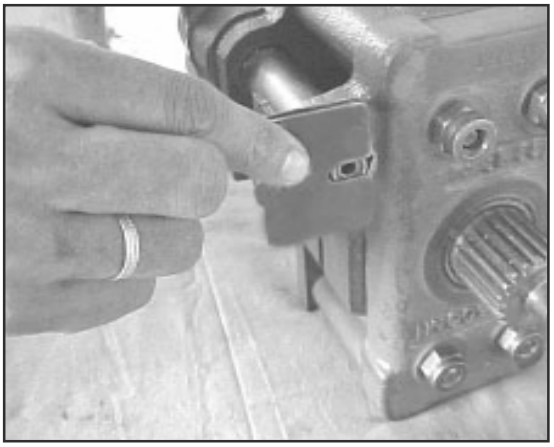


40. Remove the backup washer (fig 79).

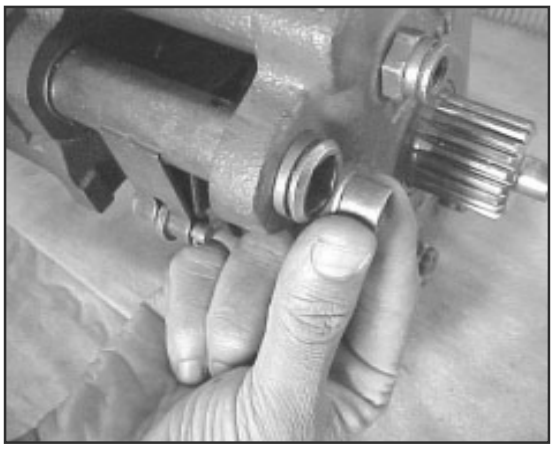


43. Remove the balancer tube (fig 82).

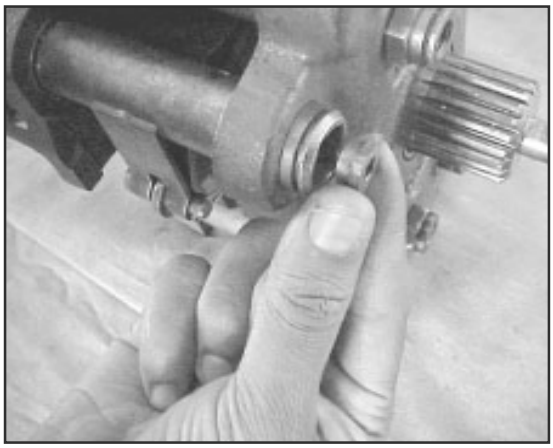
41. Remove the spacer (fig 80).



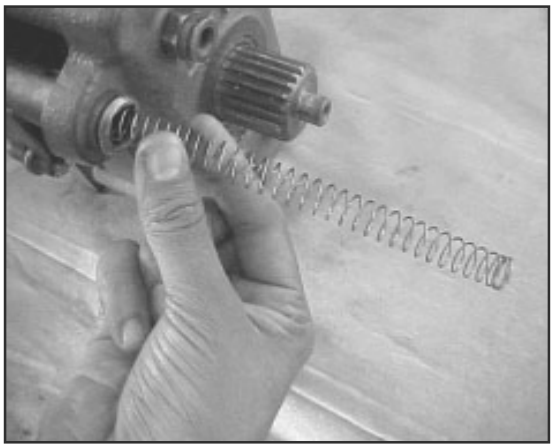
44. Remove Special Tool MF352, take care that the spring is not ejected (fig 83).



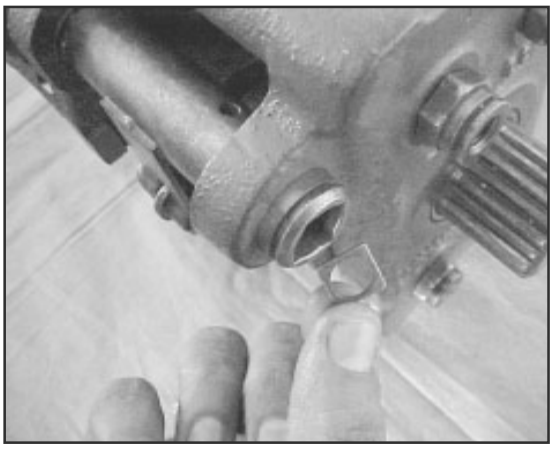
45. Remove the collar (fig 84).



46. Remove the guide (fig 85).

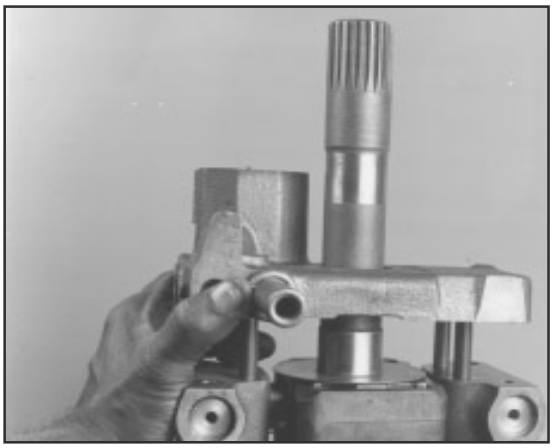


47. Remove the spring (fig 86).

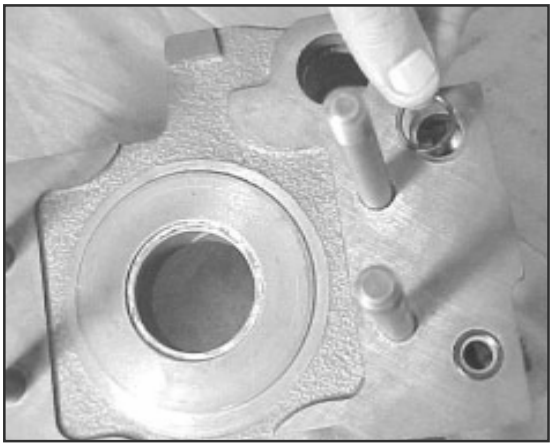


48. Remove the square disc (fig 87).

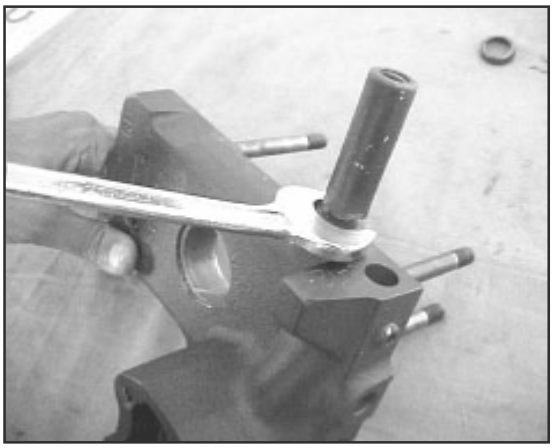
49. Remove the four main pump body nuts (fig 88).
(17 mm)



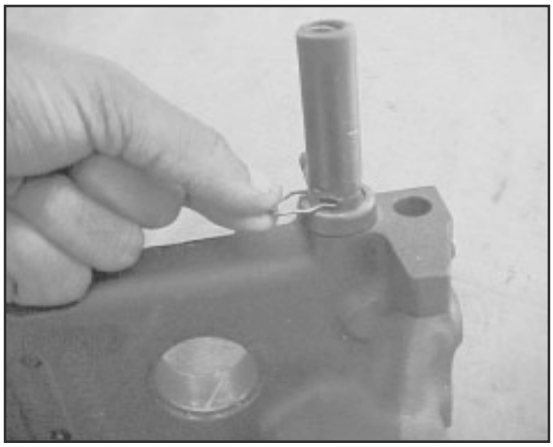
50. Detach the rear body (fig 89).



51. Remove and discard the 'O' rings (fig 90).

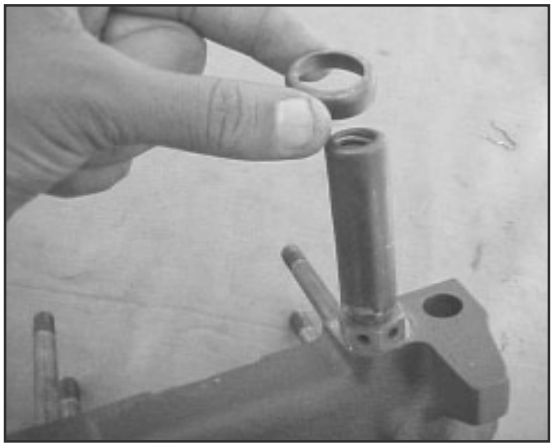


54. Remove the relief valve (fig 93). **(19 mm)**

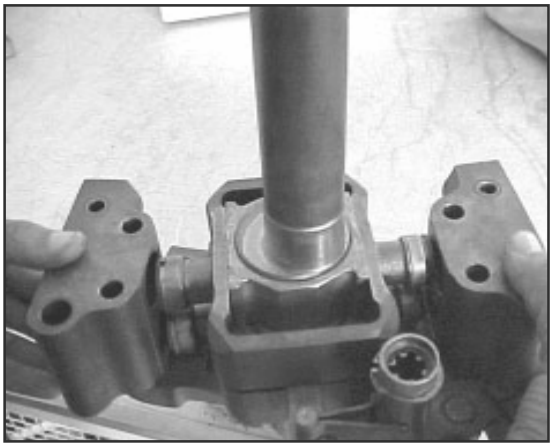


52. Remove the lock pin (fig 91).

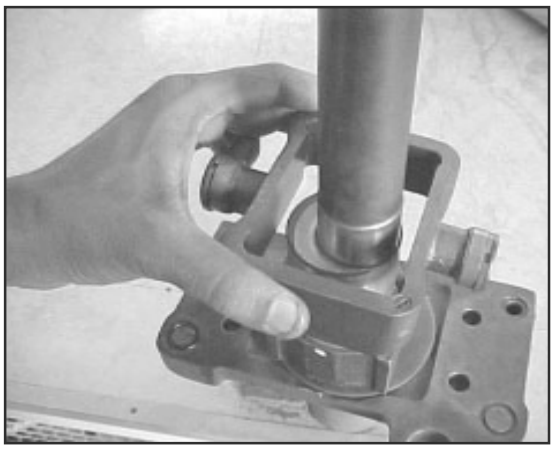
55. Remove the thrust washer (fig 94).



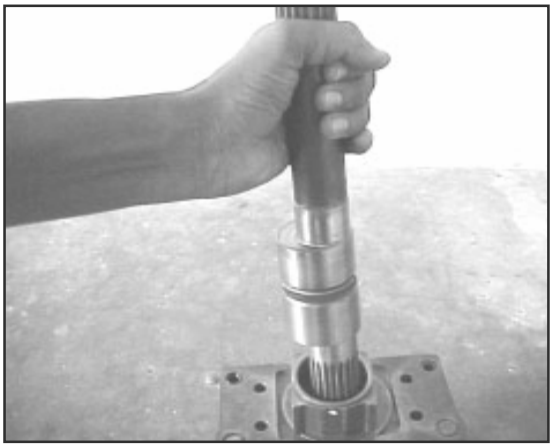
53. Remove the sleeve (fig 92).



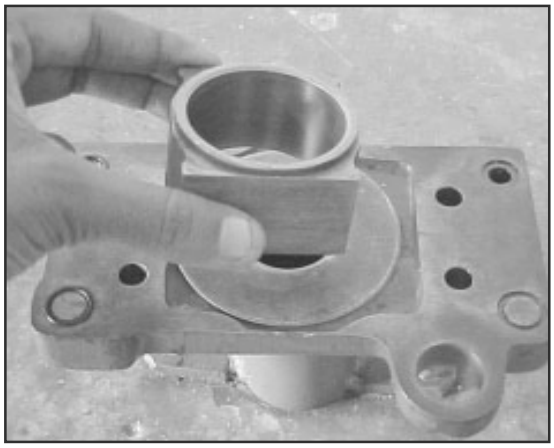
56. Withdraw the two valve chambers from the front body (fig 95).



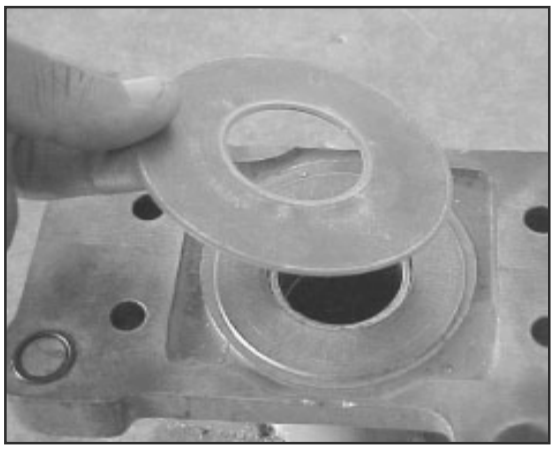
60. Remove the rear piston assembly (fig 96).



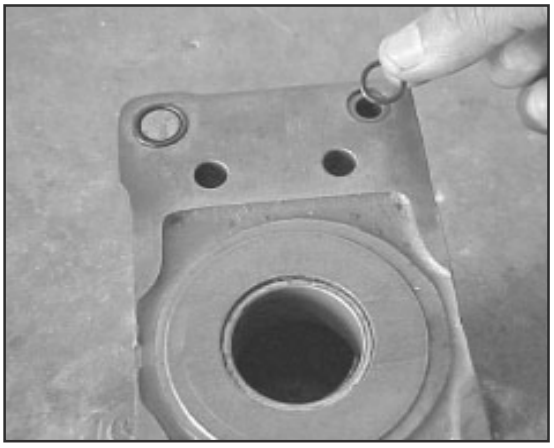
61. Remove the cam shaft (fig 97).



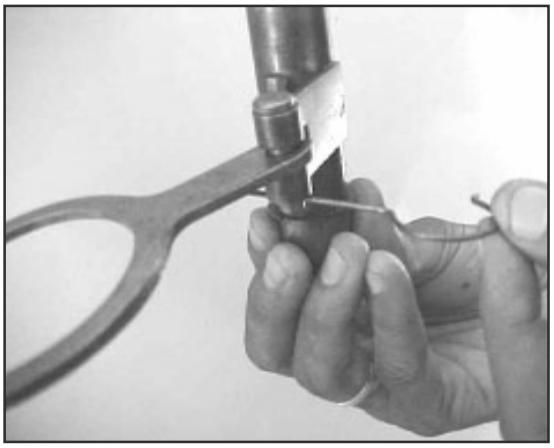
62. Remove the rear cam block (fig 98).



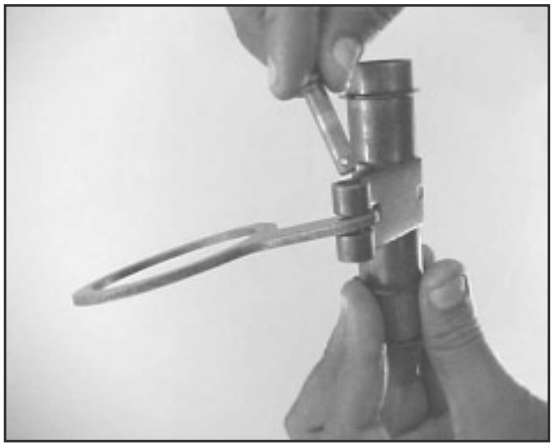
63. Remove the rear thrust washer (fig 99)



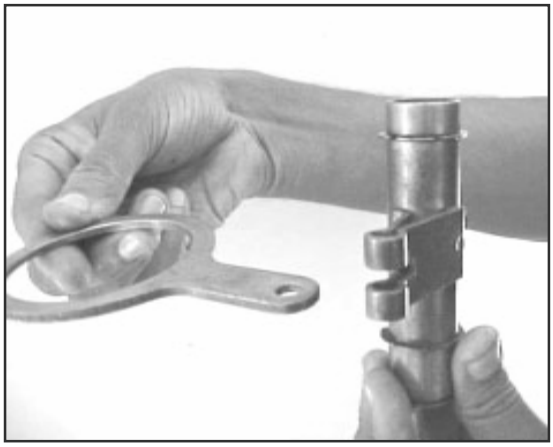
64. Remove the “O” rings from front and rear body (fig 100)



65. Remove the pin and retainer clip (fig 101).

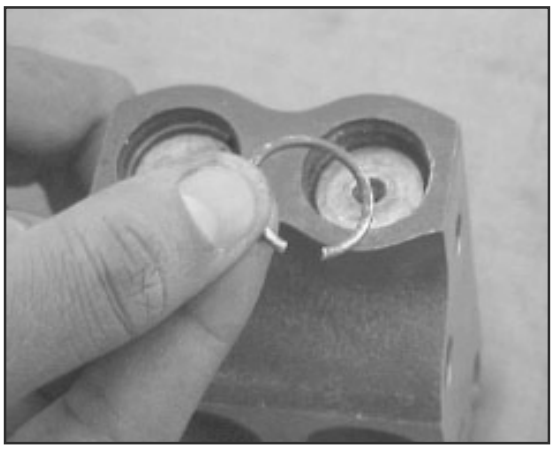


66. Remove the pin (fig 102).



67. Remove the cam follower from the oscillator tube (fig 103)

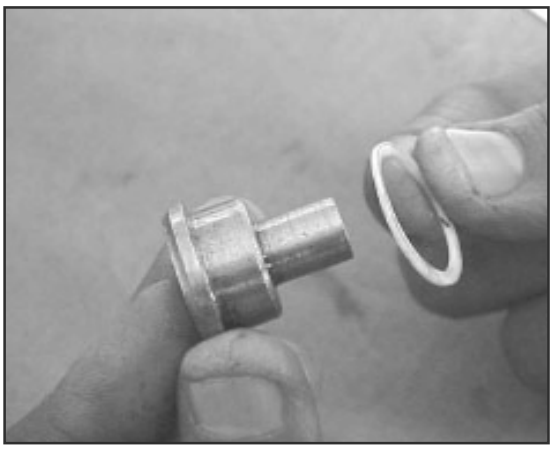
VALVE CHAMBER



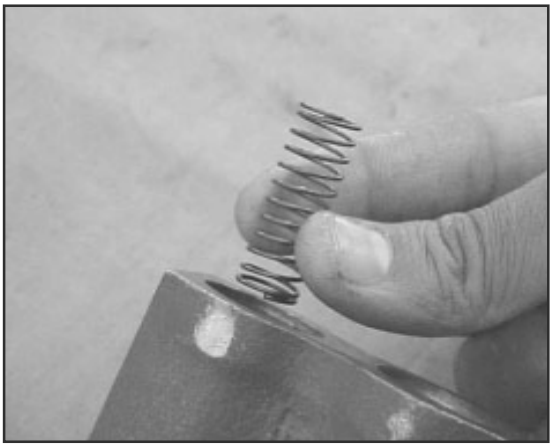
68. Remove and discard the circlip (fig 104).

69. Remove valve chamber plug out of the housing (fig 105).

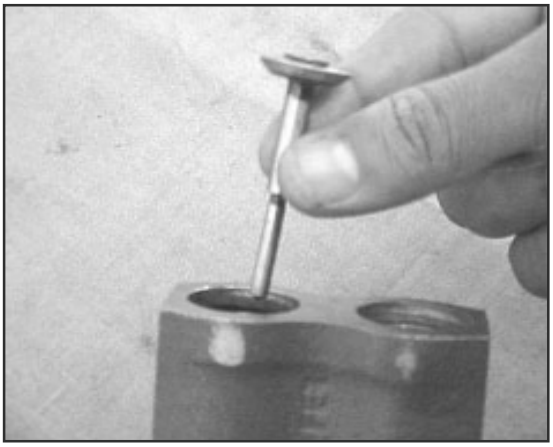
70. Remove and discard the “O” ring (fig 106).



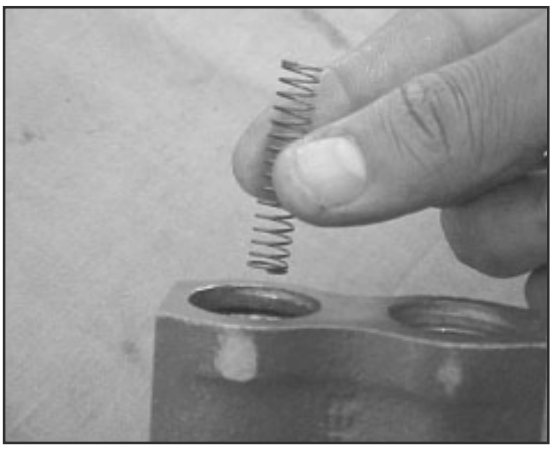
71. Remove and discard the backup washer (fig 107).



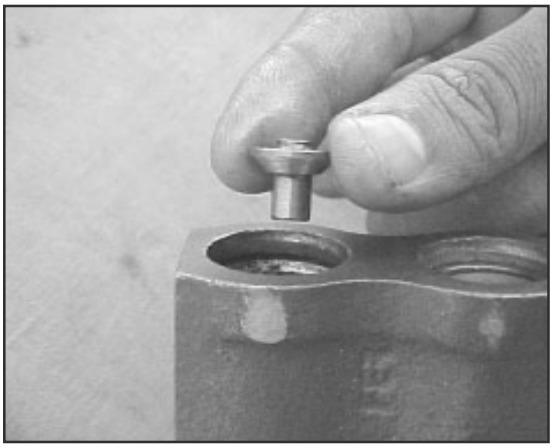
72. Remove the spring (fig 108).



73. Remove the valve (fig 109).



74. Remove the spring (fig 110).



75. Remove the inlet valve (fig 111).

76. Repeat procedure 66 to 73 for the other three valves.

Examination

Check the condition of all components for wear or damage. Replace any defective components. Always replace ''O'' rings, back-up washer, gaskets and circlips. Lubricate the ''O'' rings with oil before fitting.

Assembly

Reverse the above procedure for assembly.

77. If necessary, form new valve seats, using MF.349 valve seat cutter and forming tool in the following sequence:

78. Carry out the following:

a. Cut the top seat in the valve chamber using the large end of the cutter and tommy bar provided.

b. When satisfactory seat has been formed remove the tool and fit the sleeve to the small end of the cutter.

c. Insert the small end and carefully rotate the cutter to remove the burr around the top seat.

d. Remove the cutter and sleeve, re-insert and cut the bottom seat until a satisfactory result has been obtained. The cutter has been designed to ensure the correct depth of the bottom seat.

HYDRAULIC RELIEF VALVE

Removal and refitment

The relief valve is non-adjustable, and in the event of failure must be replaced by a new unit. It is identified by a black paint stripe on the outer tube of the relief valve assembly . The pressure of the new valve remains unchanged at 190 - 225 kg/cm^2 (2702 - 3200 psi).

Removal

1. Remove the right-hand side cover, see operation 11A . 15.
2. Remove the spring clip.
3. Remove the shield.
4. Unscrew the relief valve.

Refitment

5. Reverse procedure 1 to 4 except:
   a. Tighten the relief valve to a torque of 18.5 lbf.ft (25 Nm).
   b. Ensure that the shroud is held down so as to cover the hexagon part of the valve.

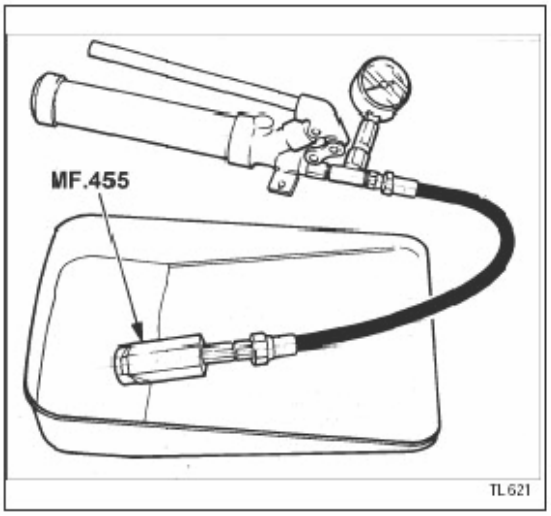


Fig 112

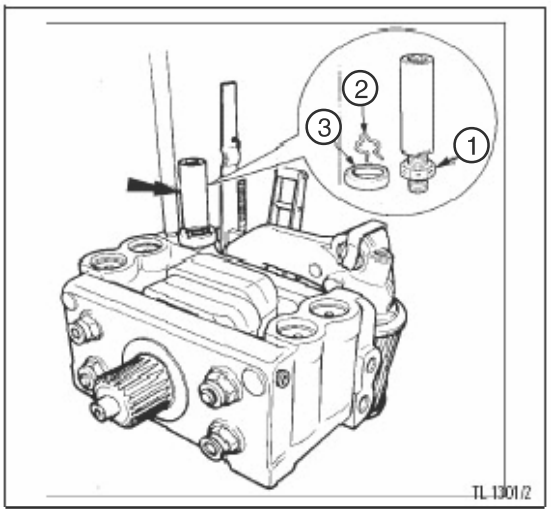


Fig 113

11 A . 15 RIGHT-HAND SIDE COVER
Removal and refitment

Removal

1. Drain the transmission oil to the LOW mark on the dipstick.
2. Remove the brake actuator if necessary.
3. Remove the dipstick.
4. Disconnect the Response Control rod.
5. Remove the right-hand side cover.
6. Remove and discard the gasket.

Refitment

7. Reverse procedures 1 to 8 except:
   a. Fit a new gasket.
   b. Locate the Response Control levers to the hydraulic pump.
   c. Seal the six bolts with Hylomar sealant.

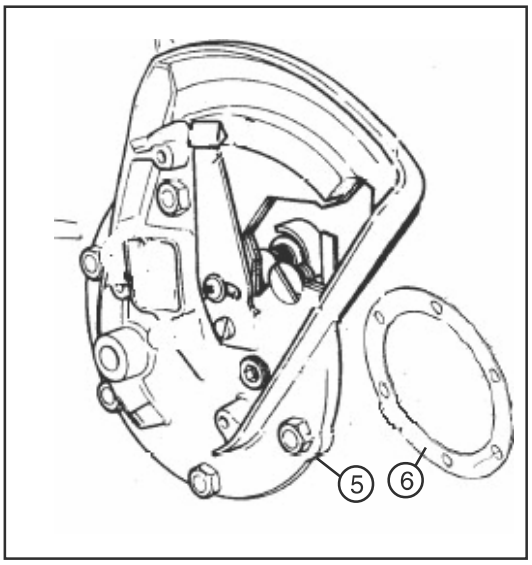


Fig 114

11A . 16 RIGHT-HAND SIDE COVER
Overhaul

Dis-assembly

1. Remove the right-hand side cover. See operation 11A . 15.
2. Remove the screw lever retaining.
3. Remove the flat washer.
4. Remove the response lever.
5. Remove pin spirol.
6. Remove the cam.
7. Remove the spring.
8. Remove the ring.
9. Remove the ‘O’ ring.
10. Remove the shaft.
11. Remove the pin spirol.
12. Remove the plate lever adjusting.

Re-assembly

13. Reverse procedures 1 to 12 except:
    a. Fit new ‘O’ rings.
    b. Fit new roll pins.
    c. Adjust the Response Control

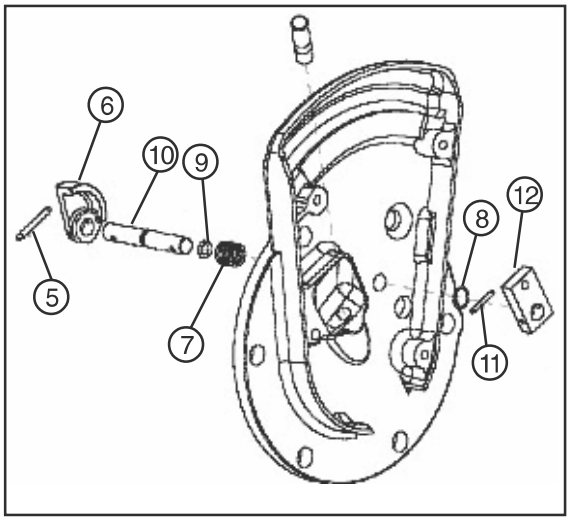


Fig 115

11A . 17HYDRAULIC PUMP OIL STRAINER

Servicing

Procedure

1. Drain the oil.
2. Remove the three bolts and washers securing the cover plate to the bottom of the centre housing.
3. Remove the cover plate.
4. Remove and discard the gasket.
5. Remove the clip.
6. Remove the nut.
7. Remove the spring.
8. Remove the washer.
9. Remove the 'O' ring.
10. Pull out the strainer.
11. Thoroughly clean the strainer in cleaning solvent and / or replace.
12. Re-assemble by reversing procedures 1 to 9 except:
    a. Fit new 'O' ring.
    b. Fit new cover plate gasket.

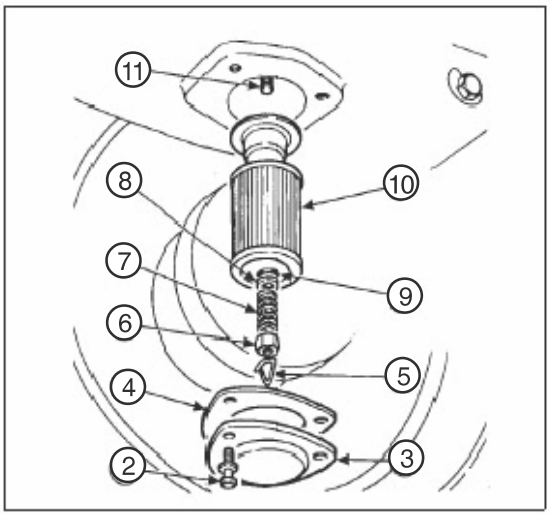


Fig 116

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